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In this Issue—

ELECTRIC-ARC FURNACES
Programming and Automatic Control - - - page 955

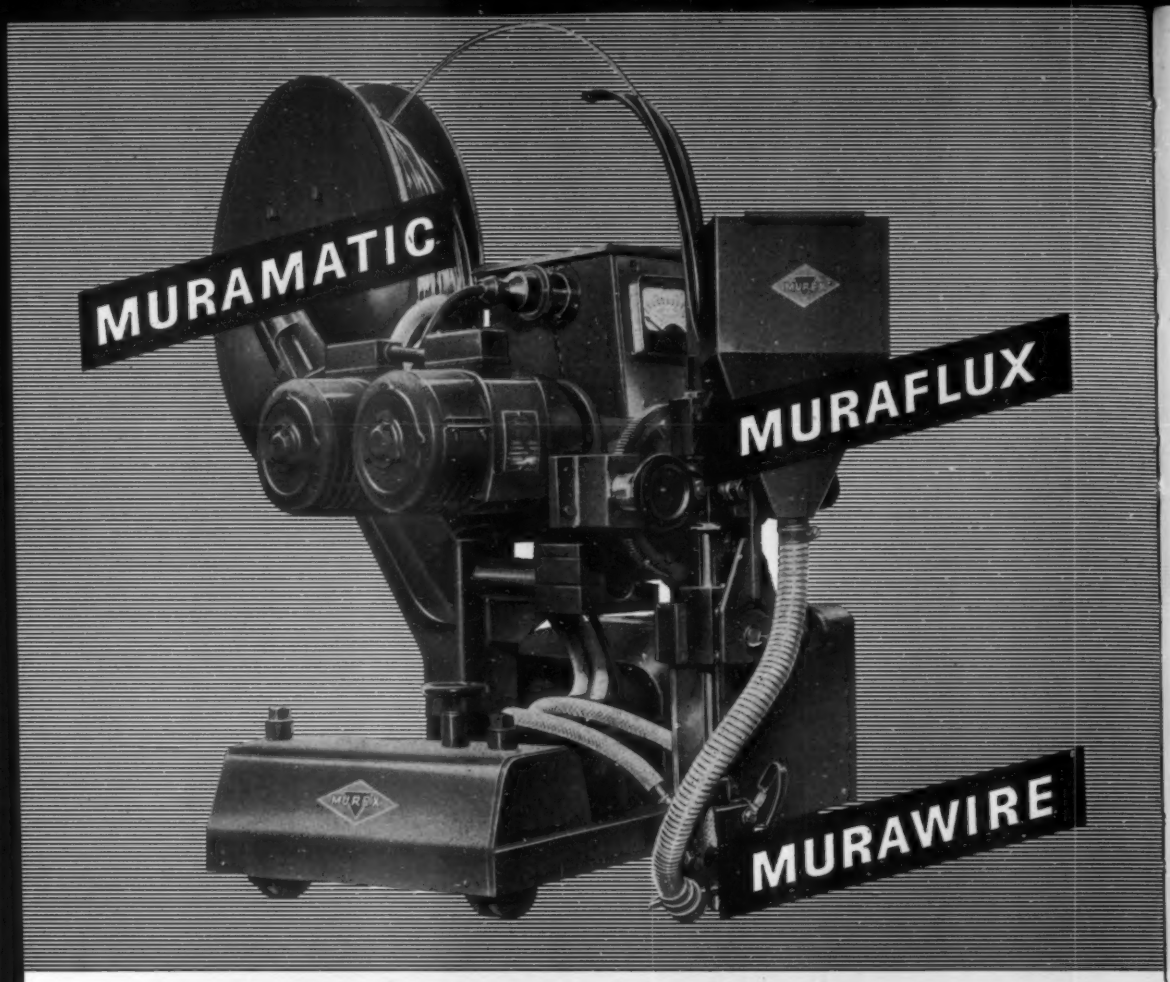
KILLOCH COLLIERY
Installation of Shaft Equipment - - - - page 959

INDUSTRIAL & DOMESTIC GAS SUPPLIES
Recent Trends and Developments - - - - page 973

BICKERSHAW PIT EXPLOSION
Divisional Inspector's Report - - - - - page 976

ELECTRIC-ARC STEELMAKING
Temperature Gradients in Furnace Roofs - - page 977

	PAGE
Leading Article: The Steel Boom	945
World's Largest Continuous Casting Plant	945
Passing Thoughts	946
AEI (Manchester) Wins Industrial Safety Award	946
Steel Merchants	947
"ECSC Production Rise Will Slow Up"	947
Greater Pit Safety Needed	948
Little Change in Coal Stocks	948
Assurance on Coal	949
Obituary	950
Apprentice Mechanics in Mines	950
Steel Companies Unite	951
Simon-Carves Wins Three New Contracts	951
Krupp Merges Coal and Steel Holdings	951
Personal	952
Welsh Boxers take NCB Trophies	953
Summer Coal Prices	954
NCB to Recruit "Green" Labour in Lancashire	954
50-ton Wagon Tippler	957
Forthcoming Events	958
Steel Production Begins at Durgapur	958
Land Reclamation After Mining Operations	972
China's Mineral Self-sufficiency	974
Hungarian Steel Combine Completing First Phase	974
Fuel Efficiency Exhibition	975
NACM Conference: Attractions for the Ladies	975
Coal-chemical Output Falling Short of Demand	976
Niobium Additions to Killed Steel	978
Metallurgical Progress	979
"Pure and Perfect Iron"	981
European Federation of Corrosion	981
Pig-iron and Steel Production	982
Law Cases	983
Non-ferrous Metals	984
Iron and Steel Trade	985
Iron-ore Imports	985
Swedish Steel Plant Plans in India	985
Appointments	986
Lincolnshire Iron and Steel Institute	986
The Coal Trade	987
Mines Mechanisation and Accident Rates	987
Miners' Relief Society Membership Drops by 3,000	987
Orders Placed	988
Inco Earnings Will be "Significantly" Higher	988
In Parliament	988
Company News	989
Increases of Capital	990
Coalfield News	991
Ruhr's Part in West German Coal Output	991
Exports of British Coal	992
Exports of Coke and Patent Fuel	992
Imports and Exports of Mining Machinery	992
News in Brief	994
Board Changes	996
Biggest-ever Transductor for Dutch Research	996
Imports and Exports of Iron and Steel	998



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IRON AND COAL
TRADES REVIEW

Vol. 180 April 29, 1960 No. 4,789

The Steel Boom

THE boom in steel is no mere flash in the pan. It has raised the industry to a state of full employment. It has stimulated an increase of 25 per cent. in the rate of production within a space of a few months, and a favourable view is taken of the prospects of still further expansion. Capital investment at an average rate of £100,000,000 per annum has been abundantly justified. Prices have been reduced, and both consumers and steelworkers have shared in the benefits of greater efficiency.

To an already heavily loaded programme of expansion based on the prosperous future of steel, the United Steel Companies, Limited, has announced a decision to spend a further £32,500,000 upon major additions to the capacity and range of operations of the Appleby-Frodingham works at Scunthorpe. A new rod and bar mill is to be installed and a continuous casting plant added to the equipment of the works. The blast-furnace capacity of the "Four Queens" at Scunthorpe is to be raised to some 2,000,000 tons a year, and at the Samuel Fox Stocksbridge works the existing steel moulding and rolling capacity is to be redeveloped, and alloy and stainless steel production increased from 400,000 to 500,000 tons a year.

In sponsoring these and other re-equipment programmes, United Steel, of course, does not stand alone. Comprehensive plans are going ahead in South Wales, and in Scotland and North-East England a substantial increase in the provision of crude and finished steel is promised before the end of the year.

All these progressive plans emphasise the providential character of the verdict of the polls in October last, which banished for a period of years, if not for ever, the shadows of predatory Socialism. Fearful of sharing the malign fate which bureaucratic rule has imposed upon other sections of the economy, is it likely that the steel manufacturers would have dared to raise their sights to the big expansion schemes which have since been evolved? If so daring, how could they have hoped to provide the large aggregations of capital required? Finance is no longer a problem of the first magnitude. United Steel, for example, expects that retained profits will make "a considerable contribution" to the company's capital expenditure, and the present high valuation placed upon steel equities suggests that additional working capital will be forthcoming from the investing public.

A test of the market will shortly be provided by the impending issue of the equity of Richard Thomas & Baldwins. It is the one remaining steel enterprise of any considerable size which has yet to be denationalised, and the response of the public to this issue will be awaited with considerable interest.

World's Largest Continuous Casting Plant

NEW four-strand continuous casting plant which Distington Engineering Company, Limited, is to build and install at the Scunthorpe works of Appleby-Frodingham Steel Company will have the largest productive capacity in the world for a machine of its type. Both companies are members of the United Steel Companies, Limited.

Equipped to cast four strands of 9-in. square blooms, the Distington machine will be designed to operate from 100-ton ladles of steel, with a weekly production capacity of 5,000 tons. It is scheduled to begin operation in December, 1961. Liquid steel will be poured from the ladle into a common tundish, with four stopper-controlled nozzles feeding direct into the copper moulds. After leaving the spray cooling chamber, the solidified blooms—withdrawn through pairs of withdrawal rolls—will be cut off vertically into 30-ft. lengths. These will be discharged at ground level by means of a discharge conveyor mechanism.

The blooms will then be transferred to a new 32-in. reversing mill for rolling into billets to feed the new Appleby-Frodingham rod/bar mill, which will have a capacity of 300,000 tons per annum of finished products.

Although the continuous casting plant will be the first to be built by Distington, the personnel of the company's continuous casting division has been closely associated with the pioneering work which United Steel has been carrying out on experimental machines over the past seven years. Inquiries for further machines are at present in course of design investigation.

How a Safety System Works in a Steel Firm

DETAILS of how accidents have steadily reduced at the Appleby-Frodingham Steel Company branch of the United Steel Companies, Limited, since the introduction of a co-ordinated accident prevention system, will be given in a joint paper at this year's National Industrial Safety Conference in Scarborough from May 27 to 29. The paper will be presented by Mr. T. P. Lloyd, works manager (services) and Mr. A. Clifford, safety officer of the company.

Working sessions of the conference will be under the chairmanship of Mr. H. R. Payne, head of the central safety department of Imperial Chemical Industries, Limited. The conference is organised by the Royal Society for the Prevention of Accidents and will be opened by Mr. Edward Heath, Minister of Labour.

Passing Thoughts . . .

THE United Steel's spending is well in line with the increased national expenditure in steel, which is expected to climb from the £99,000,000 of 1959 to about £120,000,000 this year. But would such investment have been embarked upon had the inveterate supporters of public ownership been given their way by the electorate? Is it not more likely that the industry would have been stagnantly awaiting the descent of the bureaucratic hordes of nationalisation officials? —Yorkshire Post.

What is our system of joint stock companies in this country but a form of public ownership, yet without all the disadvantages which nationalization has been proved to entail.—SIR HALFORD REDDISH, *chairman and managing director of the Rugby Portland Cement Company, Limited, in his annual review.*

While the boom has lasted since the war, the British shipbuilding industry has insisted on going about its business in its own way, ignoring any criticism from outside, and resisting any suggestion of Government interference in its affairs. But now that the shipyards are once again facing hard times the industry is beginning to show a greater willingness to listen to advice.—The Guardian.

However much they may have to learn about their trades still, the engineering and shipyard apprentices have picked up some tricks of industrial warfare. In this at least they cannot be said to lack either instruction or example.—The Glasgow Herald.

If the trade union movement will not set its house in order, as it has been invited to do often enough recently, the Government must act to protect the community at large by withdrawing a privilege that is daily being abused. It ought not to be possible very much longer for these groups to say: "I'm all right, Jack!"—Birmingham Post.

The growing practice in industry of building large open-plan single-storey factories, many of them covering 1,000,000 *sq. ft. of floor space with no provision for fire separation gives rise to grave concern.—Fire Protection Association survey.*

The phrase "sitting by Nellie" has come to denote casual and unsystematic learning of a job, in which an unskilled or semi-skilled worker is expected to pick up a new task by watching and imitating an experienced worker. A survey has shown that this is all too often the only training provided by a large number of firms in this country.—Department of Scientific and Industrial Research booklet "Training Made Easier."

Domestic heating standards in Britain are lower than people would accept anywhere else in Europe.—DR. A. ALAN TAYLOR, *NCB sales development manager.*

Fuel and power policy cannot be left solely to the free play of the market. There must be some conscious Government policy in this field.—MR. S. KESSLER, Economic Research Officer, National Union of Mineworkers.

Why don't managers learn shorthand? I learnt it 76 *years ago and during my long career in business hardly a day has passed without my using it.*—MR. T. G. JAMESON, *chairman and managing director of Hardypick, Limited, Sheffield, in a letter to the Financial Times.*

CAUTIONARY TALE

Here lies Hezekiah Burkitt
Who used two lamps to test a circuit,
With copper probes of normal shape
Covered with black adhesive tape—
A foolish practice, it is true,
But hear the dreadful story through!
Unfortunately Hezekiah,
Impelled no doubt by a desire
To do the job with all dispatch
And get off to a football match,
Failed in his eagerness to see
The terminals were marked "H.T."!
There's little more that need be said:
They were alive—and he is dead."

"Epitaph" in the Apprentices' Newsletter of No. 1 Area, Northern (N&C) Divisional Coal Board.

"Best seams first" is not a principle of economics. What to take now and what to leave for later is, in fact, a question not of economics, but of ethics.—MR. E. F. SCHUMACHER, Economic Adviser to the National Coal Board.

One day we shall awake to the prospect that the entire British coal industry will be run by only 50,000 *miners—in white collars.*—DESMOND DONNELLY *writing in the Western Mail.*

AEI (Manchester) Wins Industrial Safety Award

SIR GEORGE EARLE Trophy for industrial safety achievement has been awarded this year to Associated Electrical Industries (Manchester), Limited (formerly Metropolitan-Vickers Electrical Company, Limited), "in recognition of very many years of outstandingly successful efforts to produce a safe place of work for its large number of employees through training, both general and specific, given to all branches of personnel; by the meticulous guarding of hazardous plant and machinery, and in recognition of the generosity of the company in making its help and advice readily available to others in the interests of accident prevention."

The company's frequency rate for reportable accidents has shown a continuous downward trend. During the 12 years it has fallen from 1.13 to 0.46. Presentation of the trophy will take place at the society's National Industrial Safety Conference at Scarborough on May 27.

Short-time Steel Working Neutralised

SHORT-TIME working in the iron and steel industry has been almost completely neutralised because of the expansion in steel production, said Mr. J. Senior, divisional officer of the Iron and Steel Trades Confederation, at the divisional conference of branch officers at Redcar.

Membership in the division, he added, had reached the record level of 22,679 and was expected to top the 23,000-mark during the current year.

Steel Merchants

COULD HELP TO PROMOTE EXPORT TRADE

STRONG feeling among members of the National Federation of Iron and Steel Merchants for a need for greater flexibility by British steel producers in the export markets was expressed at the federation's annual meeting in London on Thursday of last week. The annual report states that merchants, with their long-established connections and special knowledge of oversea trade could help to promote United Kingdom exports, especially in view of the competition from continental producers who were making headway in traditionally British markets.

There was also a belief that merchants would be useful as members of trade missions sent oversea by the London Chamber of Commerce and other bodies. Steps had been taken to see that representative merchants would be considered when missions were picked for countries with which they had particularly good connections.

A steady recovery was reported in the demand for steel throughout the world last year. United Kingdom output was about 5 per cent. higher than in the previous year and in the last quarter the industry had been working at about 93 per cent. capacity.

Import Duties Questioned

The federation has raised with the Iron and Steel Board the desirability of a suspension of import duty on hot rolled sheets under ¼-in. thick. Consuming industries have not strongly supported this view and representations were unsuccessful. Representations have also been made to the Board of Trade for a suspension of duty on rolled steel bars up to ¼-in. diameter, because of short supplies. The board indicated in reply, however, that it felt existing UK capacity was adequate.

As an observer member of the International Federation of Associations of Steel, Tubes, and Metal Merchants, the federation has maintained its links with continental merchants and application has been made for full membership. This link is regarded of being of growing importance, particularly in view of Common Market developments in Europe and the formation of the European Free Trade Association.

Some improvements were reported in certain sectors of the trade in discount rates granted to merchants. In other cases, however, there has been little or no improvement. This was disappointing as it was apparent that the help given by merchants was still not fully appreciated.

PLANNING PERMISSION has been granted for Colvilles, Limited, to erect a sub-station, costing £56,000, at its melting shop and to make an extension, costing £15,000, to the locomotive sheds at the Ravenscraig plant.

A CHAIR OF ELECTRICAL ENGINEERING is to be founded at Edinburgh University. It is expected that an appointment will be made in time for the opening of the new university session in October. A refrigeration test unit has been donated to the university by L. Sterne & Company, Limited, Glasgow, and a centrifugal pump set unit has been given by the Harland Engineering Company, Limited, Alloa.

"ECSC Production Rise Will Slow Up"

PRODUCTION rise of 7.3 per cent. last year in the European Coal and Steel Community had probably continued during the first quarter of this year, said M. Roger Reynaud, member of the ECSC High Authority, in a report to the community's consultative committee. He said that industrial production may rise less swiftly in the second quarter because of the slower rate of growth in the building and foodstuffs industries.

Mr. Reynaud described the steel situation as "fundamentally sound." Consumption continued at a high level even though stockbuilding continued (although at a lower rate) and export orders dropped as a result of the rapid recovery of US production. Because of marked delivery delays of certain products, the community's steel industry would have to use all available capacity during the second quarter of the year. Supplies of raw materials provided no significant difficulties.

The coal situation remained disturbing despite some increase in demand, reported M. Reynaud. Total consumption was likely to be up by 5 per cent. during the second quarter of the year in comparison with a year ago. Demand from coking plant would probably rise by 9 per cent.; from power stations by 10 per cent.; and from domestic users by 4 per cent. Despite competition from other sources, demand from other industrial users would be maintained.

M. Reynaud recalled that in February the High Authority had given a reasoned refusal to the request for a single sales agency for Ruhr coal. Since then, the Authority had discussed the matter with the Federal German Government, producers, and other interested parties. It had decided that the old selling system due to have expired on March 31, would be prolonged until June 30. Should it prove impossible to find a formula ensuring healthy market conditions and in conformity with the Treaty, there remained the possibility of a revision of the Treaty, M. Reynaud added.

GOVERNMENT OF THE Federation of Rhodesia and Nyasaland is assessing the possibility of starting an oil-from-coal industry. This follows the announcement by the Wankie Colliery Company, Limited, that exhaustive investigations over two and a half years have shown that such an industry in the Federation could not, at present, be operated economically by private enterprise alone.

Greater Pit Safety Needed

NEED to apply all regulations and recommendations designed to achieve greater pit safety was stressed recently by Mr. H. H. Wilson, deputy production director of the Scottish Divisional Coal Board.

MR. H. H. WILSON

Mr. Wilson, who was speaking at a dinner in Shotts for the presentation of prizes to the winners of the Scottish divisional safety competition last year, was a member of the committee which framed the Mines and Quarries Act, 1954, and subsequent regulations and more recently was a member of the Bryan Report Committee.

Presenting the major award to Benhar Colliery (Lanarkshire), Mr. Wilson recalled that the colliery had won similar awards on four previous occasions. He also congratulated another Central East Area pit, Woodend Colliery (West Lothian), which showed the greatest improvement in accident frequency in Scotland last year.

Mr. W. Welsh, general manager of the Central East area, who presided, said that efforts had been made in the Area to check the progressive increase in the number of accidents. In the first quarter of this year these efforts had brought about an encouraging downward trend.

Afterwards, a presentation was made to 81-year-old Mr. Andrew Robb, who has just retired from Kingshill No. 2 Colliery (West Lothian) after about 70 years as an underground worker.

Stirling Miners' Protest Meeting

PROTEST demonstration against the contraction of the coal industry in Stirlingshire was attended by only 450 miners instead of the expected 2,000 at Stirling on Sunday. A lengthy resolution blamed the situation on the anti-working class policy of the Government which, it was stated, gave support to the oil monopolies in its endeavour to undermine the coal industry.

Mr. Malcolm MacPherson, Labour MP for Stirling and Falkirk, said that the National Coal Board's policies with regard to redundancy and pit closures should be such as would commend themselves to the public as the policies of the good, humane, and sympathetic employer. If men were to be made redundant then the first thing to see was that they were placed in other suitable employment and not simply thrown out of the mine.

WINNERS of the competition held to find Sheffield's top apprentices left on Saturday on a 10-day visit to Sweden. The six apprentices are:—D. Lomas, George Ibberson & Company, Limited; B. Giles, B & J Sippel, Limited; S. J. T. Spyve, Richards Bros. & Sons, Limited; J. G. Wright, E. Wright & Son, Limited; L. D. James, Frank Fisher & Son, Limited; W. K. Elshaw, Richards Bros. & Sons, Limited.

Little Change in Coal Stocks

UNDISTRIBUTED stocks of coal dropped slightly in the week ended April 16, but merchants are still relying to a large extent on their own stocks, nullifying the replenishment of stocks by industry and the public services. Easter Monday week output was down by nearly 1,000,000 tons, a comparable drop with that of last year.

There were 611,800 wage-earners on colliery books on April 16, against 670,700 on April 18, 1959, the numbers engaged at the coal face being 234,900 and 260,500 respectively. Total absenteeism (all workers) in the week ended April 16 was 15.83 per cent., compared with 13.75 per cent. in the week ended April 18, 1959. Output at the face was 3·987 tons and overall 1.405 in the week ended April 16, compared with 3.761 and 1.365 tons in the week ended April 18.

The following table gives (in tons) the output of saleable mined coal by division in the week ended April 23, and the tonnage lost through all causes (holiday, disputes, and go-slows):—

Division.	Week ended April 23, 1960.		Week ended April 4, 1959.*
	Total output.	Tonnage lost.	Total output.
Scottish	372,800	2,900	384,300
Northern (N & C) ..	186,000	52,300	203,900
Durham	343,600	97,800	372,000
North-Eastern ..	463,900	354,400	506,200
North-Western ..	211,800	54,300	233,600
East Midlands ..	601,000	270,800	624,800
West Midlands ..	169,700	121,200	185,800
South-Western ..	256,600	118,300	306,600
South-Eastern ..	18,900	10,200	23,300
Great Britain—			
Deep-mined coal ..	2,624,300	1,082,200	2,840,500
Other deep-mined (including licensed mines) ..	39,300	—	42,700
Open-cast coal ..	123,000	—	201,200
TOTAL	2,786,600	1,082,200	3,084,400

* Easter Monday week.

Mining Society Link with Industry Urged

IMPORTANCE of a close link between industry and Cowdenbeath Technical College Mining and Engineering Society was stressed by Mr. McC. Grassie, deputy director of education for Fife at the society's first annual dinner recently. He said that the formerly broad dividing line between technical and non-technical faculties had been narrowed and that the society should help to close the gap still further.

Afterwards, Mr. W. Rowell, general manager of West Fife Area of the Scottish Divisional Coal Board, presented a City and Guilds of London Institute bronze medal in mine surveying to Mr. Robert Martin, who gained it while a student at the college.

STEEL PRODUCTION in the USA this week is estimated by the American Iron and Steel Institute at 2,261,000 tons. This compares with the revised total of 2,238,000 tons last week and 2,627,000 tons for the corresponding week of last year.

ASSURANCE ON COAL

"Serious Challenge" from Oil, but . . .

ALTHOUGH admitting that oil presented a serious challenge to the National Coal Board in some sections of fuel demand, Mr. E. H. Browne, chairman of the West Midlands Divisional Coal Board, told Midland miners on Tuesday that even if the future was viewed in the most pessimistic light, the coal industry would still remain very large. He continued: "It ought to be unthinkable that people should worry about security of employment in the collieries. But they do. And we must do all we can to destroy the idea that coal mining is running down. Unless we do, the idea might become the fact."

Mr. Browne, who was addressing the annual Midland Area conference of the National Union of Mineworkers at Burslem, stressed that the long-term aim in the division was to get much more coal. Unfortunately there was so much misunderstanding and apprehension that doubts had arisen in the minds of many people about its future.

MR. E. H. BROWNE

"How can we convince people that the demand for coal, though lower than once envisaged, will still remain at a high level? Must the pendulum swing right back? Do we have to have another shortage of coal before we can restore confidence in the future of the coal-mining industry?" he asked.

Mr. Browne blamed the "misunderstanding and misconception" on the future of the industry for the loss of miners and the low level of recruitment. He commented: "The industry has responded to its new challenge, but I fear that some part of the improvement may represent the limits imposed by shrinking manpower. As the number of men falls it is possible for a time to carry on, but ultimately the point will be reached when fewer districts can be maintained."

"Sick to Death"

The conference unanimously decided to instruct the national executive of the union to take the necessary steps to bring about an agreement whereby all future NCB administrative staff appointments should be made by joint committees of the board and the NUM at national, divisional, and Area levels. Moving the resolution, Mr. Ron Nicholas (Arley) said that pitmen were "literally sick to death" with jobs being created for officials which had to be paid for at the point of the pick. It was particularly frustrating, at a time when production and manpower were being cut back, to find no decline on the administration side.

Mr. Jim Southall, Area general secretary, said there had been a great deal of redundancy in administrative circles. Although members might think they were seeing the same official faces, these staffs had dwindled probably more than their own. He said that without in any way decrying nationalisation, the executive felt the time was overdue for a say in future appointments in the interests and welfare of the industry.

Comparison between the wages of men at the coal face and those upon whom they were dependent—day-wage men at loading points—was made and Mr. Southall said that the problems of the piece-worker could be handled at pit level but day wages were handled at national level and it was there that they must "hammer away."

Commenting on the refusal of a Coventry branch to accept a small number of redundant foreign workers Mr. Southall pointed out that the loss of manpower was gaining momentum. Unless it stopped they would be down to less than 45,000 men. If it dropped to 40,000 the North Staffordshire plan could not go on. The Coventry branch was asked to accept the transfer with suitable safeguards for British workers.

The annual report of the executive expressed disquiet at the pneumoconiosis record in North Staffordshire. "The record in this district is the worst in the Midlands Area," it said. "We appreciate that the NCB is doing all it can to bring about dust-free conditions in the pits by wet cutting and sprays at loader-ends, etc., and we must continue to co-operate with the board towards this end."

On Monday, Mr. Will Paynter, NUM general secretary, asked why a different economic and financial policy was being pursued by the Government in relation to coal when every other native industry in Great Britain had protection in some form or another. He suggested that the industries afforded protection were privately owned. Emphasising the cutback in production and manpower, Mr. Paynter said it was equal to the strength of the biggest coalfield in the mining industry—Yorkshire.

The death occurred earlier this month at Toledo, Ohio of Mr. EDWARD GUSTAVE BRISCH, a Polish-born consulting engineer whose activities extended to several European countries, India, and America. He was 59. During the last war he came to England and worked for the Ministry of Supply in the department of tank design. After the war, he formed E. G. Brisch & Partners and devoted himself to the development of ideas on the utility for industry and commerce of scientific classification and arrangement.

Obituary

MR. JOHN GEORGE

LIFE-LONG association with the mining industry ended with the death, on April 15, of Mr. John George. He began his career in Lanarkshire at the age of 11 and was a pioneer of the miner's electric cap lamp both in England and Scotland. In 1914 he joined Caeg, Limited, Barnsley, and during his early working life he worked at practically every job in the mines. He retired in 1954 and was succeeded as the firm's northern representative by his son, Mr. M. S. George.

At 24 Mr. George gained his first-class colliery manager's certificate and he had a long and active association with the National Association of Colliery Managers, which he joined in 1912. A year later he was appointed to the council of the Scottish Branch, and in the following year he was made secretary and treasurer, an office he held for 25 years.

Mr. George represented the Scottish Branch on the NACM General Council continuously for 26 years and had served as a vice-president of the General Council. For over 20 years he was chairman of the association's Prizes Committee and, as well as being an honorary member of the Scottish Branch, he held the NACM Bronze Medal.

MR. C. D. MARLEY

MARKETING director of the Durham Divisional Coal Board, Mr. Cuthbert David Marley, has died at the age of 62. Before joining the Durham Sales Control Organisation in 1936, he was a partner of Feetham & Grieveson, coal factors. He served in the Army throughout the war, and was demobilised with the rank of brigadier, and returned to the organization for a short time before going to Germany as head of the Fuel, Power and Public Utilities Division of the British element of the Coal Commission.

Immediately prior to the nationalisation of the industry, Mr. Marley was director-general of the North German Coal Control. At vesting date he was appointed marketing director of the Northern Divisional Coal Board and he took up a similar post with the Durham Divisional Coal Board in 1950.

MR. JOSEPH STAVES

THE death has occurred of Mr. Joseph Staves, former local director of Thos. W. Ward, Limited, engineers, ironfounders, metal merchants, etc., of Sheffield. Mr. Staves began his career with the company at the age of 14 in 1903 and became chief assistant accountant in 1915 and chief accountant five years later.

He was appointed local director in 1938 and on ceasing his duties as chief accountant in 1956, he became a local director in a consultative capacity. After 56 years service with the company Mr. Staves retired a year ago.

Mr. JOSEPH FULLELOVE, a senior foreman of Newton Chambers & Company, Limited, Sheffield, has died at the age of 56. He was a founder vice-president of the work's football and sports sections and chairman of the Foremen's Association.

The death occurred last week of Mr. SIDNEY JOHN COCHRANE, a director of Cochrane & Sons, Limited, shipbuilders, of Selby (Yorks). He was 57.

Mr. PETER P. WILKINSON, a solicitor of Naas (Co. Kildare), whose death is announced, was a director of Bord na Moña, the Irish Turf Board.

Death has occurred at the age of 76 of Mr. WILLIAM CAIRNS, manager of Bothwell Colliery (Lanarkshire), until his retirement seven years ago. Mr. Cairns started work at the age of 13 as a pit boy. He joined Wilson's & Clyde Coal Company, Limited, qualified in mining engineering, and on vesting date became Group manager at Bothwell.

The death has occurred of Mr. GEORGE FREDERICK BARNES, engineer-in-charge at Coventry Colliery (Warwickshire). He was 36. He had previously worked at Sneyd, Wolstanton, and Ansley Hall collieries, and was transferred to Coventry Colliery last year. His father, Mr. G. F. Barnes, is mechanical engineer for No. 2 Group, North Staffordshire Area.

Apprentice Mechanics in Mines

REGULATION 2 of the Coal Mines (Training) Regulation, 1956, prohibits the employment in a coal mine of any person who has not previously been employed in any mine, unless, as nearly as may be immediately before he is first employed in the coal mine, he has received certain training described in Regulation 3 of those regulations. The Minister of Power now proposes to make regulations exempting apprentice mechanics and apprentice electricians from the requirements of Regulation 2 if they have received the training described in Regulation 3 at any time previously or training in accordance with Regulation 8(2) (*b*), which is for a shorter period than that described in Regulation 3(1).

The new regulations will extend the exemption contained in Regulation 8(2) to any apprentice who is employed in accordance with the provisions of an apprenticeship scheme approved by the Minister of Power. It is the Minister's intention to approve, for the purpose of the regulations, the Student Apprenticeship Scheme, introduced by the National Coal Board and covering apprentices in mining engineering, mechanical engineering, and electrical engineering.

The amending regulations will be known as the Coal Mines (Training) (Variation) Regulations, 1960, and it is proposed that they should come into operation on May 31, 1960.

UK Manufacture of German Drying Equipment

ARRANGEMENTS have been made by Foundry & Metallurgical Equipment Company, Limited, of Weybridge (Surrey) with Benno Schilde, AG, of Bad Hersfeld, Germany, to manufacture and market in Great Britain and Ireland drying equipment operating on the Benno Schilde system. The equipment includes uniflow type gas and oil fired sand driers of one to 10 ton-per-hour capacity, gas and oil fired portable mould driers, batch and continuous core and mould drying stoves, including vertical tower and horizontal tunnel type driers.

The Weybridge company is now manufacturing and marketing in this country "Lo-smoke" die sprays and die machine lubricants developed in the USA by Aldridge Industrial Oils, Incorporated. The range of lubricants includes die sprays for casting zinc and aluminium and plunger lubricants.

Steel Companies Unite

TO ENSURE OVERSEA ORE SUPPLIES

NINE of the principal British steel-making companies using imported ore have combined with the British Steel Corporation, Limited, to form a new company, British Ore Investment Corporation, Limited, (BOIC) with a share capital of £5,000,000. The main object of BOIC is to hold investments in oversea ore-mining companies, a function formerly discharged for the British steel industry solely by British Steel Corporation, an investment-holding company associated with the British Iron and Steel Federation.

The principal shareholders in BOIC, with the number of £1 shares they hold are:—British Steel Corporation, Limited (1,000,000); the Steel Company of Wales, Limited (700,000); Colvilles, Limited (650,000); South Durham Steel & Iron Company, Limited (625,000); Dorman Long (Steel), Limited (550,000); John Summers & Sons, Limited (400,000); Richard Thomas & Baldwins, Limited (400,000); Consett Iron Company, Limited (250,000); Guest Keen Iron & Steel Company, Limited (250,000); and the United Steel Companies, Limited (175,000).

Among other investments, BOIC has taken over British Steel Corporation's 20 per cent. interest in Société des Mines de Fer de Mauritanie (MIFERMA), a £60,000,000 project in French West Africa, whose capital, equivalent to about £19,000,000, is being subscribed together with French, Italian, and German interests. MIFERMA will ultimately produce 6,000,000 tons of iron ore a year. The ore will be transported on a railway, to be specially constructed, over about 400 miles to a port to be built near Port Etienne in Mauritania.

The new company has also taken over the 30½ per cent. British participation in the Compagnie Minière de Conakry, a company mining ore in Guinea.

Simon-Carves Wins Three New Contracts

THREE important contracts have just been won by Simon-Carves, Limited. The first, awarded by the Steel Company of Wales, Limited, is for gas-cleaning plant on two 400-ton open-hearth furnaces to be installed at Port Talbot. The contract is stated to include provision of equipment for dust conveying and disposal.

The South Durham Steel & Iron Company, Limited, has awarded the company a contract for fume removal and gas-cleaning plant for a hot slab scarfing machine, to form part of the new plate mill being installed at South Works, West Hartlepool. The plant comprises an electro-precipitator, gas storage vessel, interconnecting ducts, fan, and stack.

A contract for a further sulphuric acid plant with a daily capacity of more than 200 tons has been ordered by W. & H. M. Goulding, Limited. The plant will be in the Dublin area and is expected to be ready by the summer of next year.

Krupp Merges Coal and Steel Holdings

REORGANISATION by the Krupp concern of its wholly owned coal and steel interests into a single joint stock company has been completed. The sole shareholder of the company is Herr Alfried Krupp. The company—Hütten und Bergwerke Rheinhausen, AG—was formerly a Krupp holding company, while the operating companies were run as separate entities. Companies in which there are minority shareholders, notably Bochumer Verein (steel), were excluded from the merger.

Herr Beitz, chairman of the supervisory board, said on Sunday that an offer had still not been received for its merged coal and steel holdings. The holdings must be sold under an agreement made by Krupps in 1953. A commission of the Western Allies and West Germany earlier this year extended the time limit for the sale until January 31, 1961. Herr Beitz added that the coal business was not in a good position and that steel was also not producing high earnings at present.

At a meeting of the German steel concern, August Thyssen-Hutte, AG, the chairman, Dr. Hans-Gunther Sohl, appealed to the public and political opponents to drop opposition to the proposed Phoenix-Rheinrohr, AG, merger, which the High Authority of the European Coal and Steel Community has yet to approve. He said there was no question of a concentration of two unrelated companies, but a rejoining of formerly broken hereditary interest of the Thyssen family.

The merger would hardly alter the production programme of the group, he said, and the group was prepared to draw up contracts limiting further the Thyssen industrial powers. It was not, however, ready to give up its holdings in the Stahl- und Walzwerk Rasselstein/Andernach steel and rolling mills company.

Probe Labour's Decline Urges Mr. H. Douglass

IT was difficult to conceive how gang warfare within the Labour Party would inspire the electorate's confidence in the party's capacity to govern, said Mr. Harry Douglass, general secretary of the Iron and Steel Trades Confederation, in a speech at Swansea on Saturday. Unless an objective examination of causes of the decline in Labour's electoral appeal was made, the party could well drift into obscurity, he said.

Mr. Douglass added that there was no reason to be despondent about the prospects of arresting the decline if a serious attempt were made to understand and profit from the lessons of defeat.

Personal

Mr. A. FRANKLYN WILLIAMS is to succeed Mr. J. W. Davies as the Ministry of Power's senior officer for Wales.

Mr. DENIS P. GAVAGHAN, a director of Heybrook Welding & Engineering Company, Limited, Rochdale, has been elected chairman of Rochdale Round Table.

Mr. JOHN PRICE, sales manager of Pollard Bearings, Limited, group, Knottingley (Yorks), left last week on a tour of the company's distributors in the USA and Canada.

Mr. C. W. OATLEY, who has been elected Professor of Electrical Engineering at Cambridge University, is Reader in Engineering in the university and Fellow of Trinity College, Cambridge.

Presentation was made recently to Mr. OLIVER MORTON, foreman of the works service department of Wharton Crane & Hoist Company, Limited, of Reddish, near Stockport, in recognition of 50 years' service with the firm.

Mr. R. A. ERSKINE, chairman and managing director of Erskine Heap & Company, Limited, switchgear and motor control gear manufacturers, of Manchester, has been elected a director of the Manchester Guardian Society for the Protection of Trade.

Mr. T. SANDERSON, director and general manager of the Workington Iron & Steel Company, Limited, has been appointed vice-chairman of the Cumberland and Westmorland District Advisory Committee of the North Regional Board for Industry.

Mr. JOHN RYAN, vice-chairman of the Metal Box Company, Limited, has accepted an invitation to join the board of E.V. Industrials, Limited, and has been appointed chairman in succession to Mr. SYDNEY H. NEWMAN, who has consented to act as deputy chairman.

Presentation was made to Mr. JOHN MITCHELL on his retirement as industrial relations officer of the West Ayr Area of the Scottish Divisional Coal Board. Mr. Mitchell, who received his gift from Mr. R. D. Glass, the Area manager, is to be succeeded by Mr. J. COYLE.

Mr. REGINALD STUART BRUCE, managing director of G. & J. Hall, Limited, engineers' tools manufacturers, of Sheffield, and its subsidiary, the Hartshead Engineering Company, Limited, has been elected president of Sheffield Chamber of Commerce. At 47, Mr. Bruce is the youngest man to have held the office.

Newly-elected president of the South Wales branch of the National Union of Manufacturers is Mr. LEONARD G. OXFORD, managing director of Simmonds Aerocessories, Limited, and Firth Cleveland Instruments, Limited, both of Pontypridd. The companies are members of the Firth Cleveland group.

Mr. NORMAN ELLYARD LANGDALE, education officer of Imperial Chemical Industries, Limited, has been seconded by ICI to perform the duties of director of practical training and placement at the College of Engineering and Technology, Delhi, for two years, under the Technical Co-operation Scheme of the Colombo Plan.

Newly-elected president of the North-east Coast Institution of Engineers and Shipbuilders is Mr. JAMES BREWIS WOODESON, chairman of Clarke, Chapman & Company, Limited, manufacturing marine and electrical engineers, etc., of Gateshead. Mr. REGINALD IBISON, director and general manager of Hawthorn, Leslie (Shipbuilders), Limited, of Hebburn-on-Tyne, has been elected vice-president.

A presentation has been made to Mr. JOHN MACDONALD, who has retired for health reasons after 15 years as safety training officer at Kingshill No. 1 Colliery (Lanarkshire). Mr. Harry Telfer, Area industrial training officer, made the presentation on behalf of the Central East Area safety department. Mr. Macdonald, who has worked for over 50 years in the mines, went to Kingshill 40 years ago.

Mr. ARCHIBALD STARK, mechanical maintenance superintendent at Steel, Peech & Tozer branch of the United Steel Companies, Limited, was presented with a scale model of a 105-ton-capacity ladle mounted on an ash-tray last Friday. Mr. Stark is to retire in June. The model was made by six apprentices, and presented by senior apprentices, David Wheatley and Michael Wall at the open day for apprentices' parents.

Mr. F. W. GARDNER is retiring as chairman of C. A. Parsons & Company, Limited, engineers and turbine manufacturers, etc., of Newcastle-upon-Tyne. He is succeeded by the deputy chairman, Mr. H. H. MULLENS, who is also chairman of A. Reyrolle & Company, Limited, Hebburn-on-Tyne, an associated company. Mr. Gardner became chairman of Parsons on the death of Sir Claude Gibb just over a year ago.

Mr. GEOFFREY BANKS has been elected president of the Engineering Centre, Birmingham, in succession to Mr. VICTOR BRENNER. Mr. Banks, a director of Johnsons Iron & Steel Company, Limited, and Johnsons Rolls, Limited, West Bromwich, has been treasurer of the committee for the past four years and a committee member for six. Mr. Brenner was appointed vice-president, and Mr. J. TREVOR JONES, a director of M. & W. Grazebrook, Limited, Dudley (Worcs), treasurer.

Mr. M. MARK FIRTH, for many years a director of Thos. Firth & John Brown, Limited, Sheffield, has been reappointed a trustee of the Firth's Almhouses Trust, Sheffield, of which he has been chairman since 1932. New trustees include Mr. J. HUGH NEILL, a deputy chairman and joint managing director of James Neill & Company (Sheffield), Limited, and last year's Master Cutler; Mr. GEOFFREY M. FLATHER, a director of W. T. Flather, Limited, and of the National Industrial Fuel Efficiency Service, and Mr. A. B. HAMPTON, chairman of C. & J. Hampton, Limited.

USSR-UK Trade

PRESIDENT of the Russo-British Chamber of Commerce, Sir Greville S. Maginess, said at the annual meeting on Thursday of last week that it was his considered opinion that the trade between the two countries could be considerably expanded and that the economic climate was never more favourable to achieving this end. The largest contribution to the UK exports was made by machinery at £10,600,000, copper at £5,400,000 was second, and iron and steel, consisting mostly of steel tubes and sheets, contributed £3,900,000. Imports of non-ferrous metals from the USSR amounted to £4,500,000 and iron and steel (mainly pig-iron) came to £1,600,000. The council's membership was now approaching 580.

Replying, Mr. S. F. Anfimov, vice-president, said that the Soviet Union was increasing her trade with some other industrial countries more quickly than with the UK. Normal trade relations were not helped by the embargo list.

THE NORWEGIAN PARLIAMENT has voted by 67 to 53 to authorise the Government to take shares for a further 30,000,000 crowns (£1,500,000) in the ferrous metals plant of Mo-i-Rana.

WELSH BOXERS TAKE NCB TROPHIES

Outstanding Success at Glasgow Finals

By P. E. CARDEN

NON-PARTICIPANTS in the mineworkers' national amateur championships for the past two years, the Welsh boxers made a notable return in Saturday's finals at the St. Andrew's Halls, Glasgow. The five Welsh title seekers were all successful, and the Mitchell-Hedges Trophy, awarded to the divisional team gaining the most points at the national finals, went to the South-Western Division for the third time in 12 seasons of NCBABA championships. Presentation of the trophy was made by Mr. James Crawford, industrial relations member of the National Coal Board, to Mr. Albert Walsh, deputy chairman of the South-Western Divisional Coal Board.

There was further success for the Welsh contestants. The Viscount Hyndley Trophy, awarded to the Area gaining the most points throughout the championships, was won by the South-Western Division's No. 4 Area for the first time. The trophy had been held by the No. 1 Area, West Midlands Division, for the past four years.

MR. JAMES CRAWFORD

For the four Scottish boxers the finals, held in Glasgow for the first time, brought only disappointment. Last year's winners of the Mitchell-Hedges Trophy were, in fact, summarily dismissed when the decisions in the first three championship bouts went against them.

Mr. Moffat in the Chair

If the people of Glasgow failed to support the miners' championships as well as had been expected, the boxers and officials received a cordial welcome and generous hospitality in accordance with Scottish tradition.

Mr. Abe Moffat, president of the Scottish Area of the NUM, was in the chair at a luncheon given by his executive committee in the Banqueting Hall of the City Chambers. Mr. Crawford, an ex-Baillie of Glasgow, and Mr. R. W. Parker, chairman of the Scottish Divisional Coal Board, returned thanks to the union and to Glasgow Corporation for the use of the magnificent hall. Many in the official party later saw the Scottish Cup Final at Hampden Park. Hosts at a reception before the boxing were members of the Scottish Divisional Coal Board.

In addition to Mr. Crawford and Mr. Parker, Mr. W. H. Sales, chairman, North-Eastern Divisional Coal Board, Dr. William Reid, chairman, Durham Divisional Coal Board, Mr. Walsh, and many other NCB and NUM personnel saw the boxing.

Pattern of the evening's results—the rise and fall of Wales and Scotland, respectively—was forged at the outset, when D. James (South-Western) won the flyweight title in a dramatic bout with A. Gilmour (Scottish). The Scot was confident enough and it was a big surprise when, in the second round, he went down for a count of eight. He seemed eager to continue, but he was obviously dazed and the referee stopped the fight. The second Scot to receive an adverse decision was R. Galloway, whose bantamweight contest with W. H. Williams (West Midlands) was certainly no classic. There were some hard exchanges, but little finesse. The majority decision against the Plean Colliery oncost worker was justified, but it did not go down well with those who had hoped to see the Scottish representatives distinguish themselves.

Wales and Scotland were matched for a second time when D. Bowers met the holder of the featherweight title, C. Salter. Both men were slow to settle down and it was not until the third and last round that Bowers made quite certain that the verdict would be in his favour.

Lightweight honours also went to the South-Western Division, whose 18-year-old D. Harris gave a convincing display against J. E. Ginty (Durham), who is 24. After two hard rounds one was entitled to expect something rather better than the final period actually produced. Ginty was a game loser.

One of the best contests was that in which G. W. Rees (South-Western) outpointed P. O'Rorke (North-Eastern) in the light welterweight class. If Rees led throughout, the haulage worker from Denaby Main Colliery was never far behind. He recovered well after falling through the ropes in the first round and there was much good boxing up to the final bell.

The welterweight bout also brought two good boxers together. F. Powney (North-Eastern), outpointed by J. Gamble (South-Western), put up a fine performance and, although the judges were unanimous in giving the Welsh lad the verdict, the margin between the two must have been slender.

N. Biggs, who works at Tilmanstone Colliery, was the only representative of the South-Eastern Division to reach the national finals. His opponent in the light middleweight contest was S. Pearson (North-Eastern), who, in 1958, won the ABA light middleweight title and the NCBABA middleweight title on successive nights. He was also a silver medallist at the British Commonwealth Games in that year. Last year Pearson retained his title in the mineworkers' championships, and on Saturday he had little difficulty in gaining the title at his new weight. Not until the second round did Pearson reveal his class, but there was never any doubt about the outcome against a

man who did not appear to be quite fit enough seriously to challenge his experienced opponent. The fight was stopped in the third round.

NCBABA light welterweight champion in 1955 and again in 1956, J. M. Woods (West Midlands) on Saturday assumed Pearson's former role as middleweight title-holder. His bout with T. Casserly (Scottish) was disappointing. Spoiling tactics marred what promised to offer something much better. The Scot was the chief offender and the judges' decision in favour of the underground worker at Cannock Wood Colliery was unanimous.

There were also far too many interruptions in the light heavyweight contest, in which J. G. Bodell (East Midlands) outpointed J. Taylor (North-Eastern). Bodell, who is 19, is a coal sampler at Moira Colliery; he won the title last year and had no great difficulty in retaining it on Saturday against his 30-year-old opponent.

E. Ball's Record

In retaining the heavyweight title, E. Ball (West Midlands) set up a NCBABA record by gaining the same title four times. He was also the light heavy champion in 1955. In J. G. Mitcheson (Durham), Ball found a competent opponent, but the holder largely dictated the way things should go. Mitcheson, thrown off his balance by Ball's opening onslaught, recovered well. He had to accept some punishment, which he did gamely.

Results of special bouts:—FLYWEIGHT: A. Young (Scottish) outpointed J. E. Wright (West Midlands); FEATHERWEIGHT: J. R. Jackson (North-Eastern) outpointed H. Brown (West Midlands); LIGHT WELTERWEIGHT: W. Hockridge (Durham) outpointed T. Halpin (Durham); WELTERWEIGHT: E. Edwards (West Midlands) outpointed W. Lee (Durham); LIGHT MIDDLEWEIGHT: F. W. Turner (West Midlands) beat J. Fisher (Scottish), the fight being stopped in the first round.

Music was played during the evening by the Kinneil Colliery Silver Band.

Congratulating the Welsh boxers on their success, Mr. H. Atkinson, chairman of the NCBABA, speaking at supper following the boxing, expressed his pleasure at their return to the championships. Replying, Mr. Walsh said he was naturally very proud of the South-Western Division's success, which he attributed to fine team work all round. Mr. Crawford, Mr. Parker, and Dr. Reid also spoke briefly.

Much of the credit for the success of the championships was again due to the energy and enthusiasm of Mr. Jack Reading, the association's hon. secretary, while the financial side of the boxing was in the able hands of Mr. Arthur J. White, the hon. treasurer.

Summer Coal Prices

SUMMER prices for house coal come into effect on Sunday. National Coal Board prices will be reduced by 20s. a ton, compared with a cut of 17s. 6d. a ton made on May 1 last year. Merchants are expected to pass the saving on to the consumer and those in London have stated that they will do so.

The reduction, which will cease after October 31, 1960, applies also to anthracite, "Phurnacite," and briquettes, and the manufacturers of "Coalite" and "Rexco" have agreed to apply the reduction at the same time to their products.

NCB to Recruit "Green" Labour in Lancashire

FOR the first time for 18 months, the North-Western Divisional Coal Board is to recruit "green" labour from outside the industry. The ban, the board states, has been lifted for Bradford Colliery, which, during the past 10 years, has been completely renewed on the surface and underground. The board intends now to increase the daily output here from 2,300 tons to 3,000 and plans to raise the present labour force of 2,000 by several hundred.

Since there is no surplus of trained miners in the immediate neighbourhood of the colliery, trainees will be recruited and given several weeks' paid instruction before going down the pit. The ban is expected to remain for other Lancashire pits, but it does not apply to juveniles.

Plans are also in hand to spend a total of £3,500,000 to reconstruct Bickershaw No. 2 and Parsonage No. 2 collieries at Leigh. At Parsonage, where £2,000,000 of this sum will be spent, the colliery surface installation is to be reorganised and a new coal washing plant installed. A new tunnel is to be driven underground to open up richer seams, and the adoption of single-shaft winding will make winding arrangements more efficient.

Bickershaw will account for the remaining £1,500,000. New tunnels will be driven to tap reserves of good quality coal and new seams will be opened to replace those being worked at present which are driving into coal of a lower quality. This 80-year-old colliery is one of the largest in the north-west and has a labour force of 2,000. An underground explosion last October closed one seam and cut the daily output to 2,800 tons. When the new work is completed the figure will be increased to about 4,000 tons.

NEW INDUSTRIAL USE OF SOMERSET COAL

"SPREADER" type of stoker, capable of burning Somerset coal, has been installed in the Somerdale (Bristol) factory of J. S. Fry & Sons, Limited, chocolate manufacturers. Somerset coal has hitherto been considered unsuitable for burning on mechanical stokers of the "chain grate" type.

The company uses 15,000 tons of coal a year. Before the new stoker was installed all its coal came from the Forest of Dean, but now half the supplies—all used on the new stoker—are of Somerset coal.

"Fry's success with Somerset coal on its new stoker is a good augury for the future of the local coalfield," said Mr. D. F. Pexton, marketing director of the South-Western Divisional Coal Board. "Not only does it mean that we have a steady customer in Fry's, but if other firms decide to profit from this experience we will be able to build up an industrial demand for a coal which has previously been regarded as mainly suitable for power stations."

FIFTEEN JUNIOR employees of the Staveley Iron & Chemical Company, Limited, and its subsidiary, the Sheepbridge Company, Limited, of Chesterfield, have been sent on an eight-day visit to industrial plants in Holland and Belgium. The companies are paying all expenses.

PROGRAMMING AND AUTOMATIC CONTROL OF

Electric-arc Furnaces

By J. RAVENSCROFT, B.Sc., A.M.I.E.E., A.R.T.C.S.

Automatic control of an arc furnace according to a predetermined optimum power input programme will save electricity and reduce melting time. The author describes in this paper how the APIC (the Automatic Power Input Control) developed by the British Iron and Steel Research Association can provide such control. He gives the results of trials on an experimental and a small production furnace.

IF electric-arc furnaces are to be used to the best advantage, and especially if they are to be automatically controlled, it is essential to determine, by performance trials, the optimum power input programme.

Investigations have shown that a good guide to the efficient use of electric power is the temperature of the roof refractories, because unduly high temperatures indicate that power is being wasted. The investigations suggest that there are optimum voltages for each part of the steelmaking process, and that furnace voltage and power input should be adjusted, during melting, to suit the conditions of the charge and the temperature of the furnace refractories.

The melting period can be divided into three separate stages:—

1.—The first few minutes after switching the power on, when the three electrodes bore down through the charge until they are arcing on to molten metal at the bottom of the bath.

2.—The second stage, when the three arcs are completely surrounded by scrap and the charge is being melted from the bottom upwards.

3.—The last stage, when all the scrap has fallen away from the electrodes, directly exposing the furnace refractories to radiated and convected heat from the arcs, and there is a large pool of molten metal in the centre of the charge.

When the power is switched on at the start of the melt the voltage should not be too high, otherwise the arcs will be too long, power will be wasted, and the roof refractories may be damaged. Another reason for keeping the voltage down is that the rate at which the electrodes penetrate the charge can be greater at medium than at high voltage. For example, in the BISRA 10-cwt. experimental arc furnace, with a charge of light tube scrap, the rate of penetration was greater with an electrode current of 3,000 A and a furnace voltage of 110 V than with a current of 2,300 A and a furnace voltage of 180 V.

During the second stage of melting, all the available power can be put into the furnace, and the electrical losses will be lowest when the furnace is operated on the highest voltage tap.

The critical point is when the charge falls away from the electrodes and exposes the walls and roof to direct radiation from the three arcs. When this happens the arc length should immediately be reduced, and this is best accomplished by reducing the voltage and keeping the current constant, for arc length is proportional to voltage and for a given furnace voltage decreases with increase of current.

The reduction of power input during the last stage of melting should reduce the overall electricity consumption without increasing the melting time. In fact, in the BISRA experiments, proper programming reduced the average melting time by 8 per cent. and the electricity consumption by 13 per cent.

10-cwt. Furnace Performance

The BISRA 10-cwt. arc furnace has been fully described elsewhere[1]. The furnace transformer has a rating of 500 kVA. and has eight voltage tappings ranging from 64 to 180 volts; tap changing is off-load.

Previous investigations on this furnace[2] have shown that electricity consumption during melting can be reduced by cutting down the high power (180 V at 2,300 A) to a medium value (88 V, 2,700 A) at about two thirds the way through the melting period; this, however, resulted in a 10 per cent. increase in melting time (*i.e.*, time from "power-on" to "melt-out").

More recently, further performance trials have been made and have resulted in the development of the optimum power input programme for this furnace when using a 10-cwt. charge of tube scrap, the furnace starting from cold. The results from each stage of the trials are shown in Table 1, and a comparison is given of furnace performance before programming and with the final optimum power input programme.

This work on the 10-cwt. furnace has shown that not only is it possible to reduce electricity consumption by proper programming of power input during melting, but melting time also can be reduced with a corresponding increase in production rate. The reduction in the average roof temperature level at clear-melt confirms that the savings have resulted

TABLE 1.—*Determination of the Optimum Power Input Programme for the 10-cwt. Arc Furnace.*
(Charge Weight—10 cwt.: First heats of the day.)

Furnace control settings during melting.	No. of casts.	Average time to clear melt (1,600 deg. C.). Min.	Average electricity consumption (kWh.).	Roof temperature at clear melt (deg.C.).
180V. 2,300A. for complete melting period	4	51	461	1,201
180V. 2,300A. for 25 min., 88V. 2,700A. to clear melt	4	57.5	448	988
110V. 3,000A. for 20 min., 88V. 2,700A. to clear melt	3	53	400	926
110V. 3,000A. for 5 min., 180V. 2,300A. for 15 min., 88V. 2,700A. to clear melt	4	52	403	785
110V. 3,000A. for 5 min., 180V. 2,300A. for 15 min., 104V. 2,700A. to clear melt	5	47	400	866
Percentage improvement, last versus first	—	8	13	28

from a general decrease in the heat losses during melting.

Automatic Control

In order to apply the optimum power input programme automatically BISRA has developed an automatic power input controller (APIC)[3] which controls the order of events in the furnace according to time and the attainment of predetermined values of roof temperature or rate of temperature rise.

The roof-temperature and rate-of-temperature-rise measuring devices are electrically connected to a potentiometric controller, and a synchronous time relay is incorporated to give fixed time intervals. The heart of the system is a two-direction stepping switch, which is actuated by both the timer and the temperature controller.

When the APIC is used on the 10-cwt. furnace, the stepping switch is wired to select the 110-V tap at the start of each heat to commence melting. After a suitable time, governed by the rate of penetration of the electrodes, the timer moves the stepping switch so that the 180-V tap is selected. When the rate of roof temperature rise reaches a critical value a set of contacts closes, and the 104-V tap, which is used for the remainder of the melting period and part of the refining period, is selected.

From this stage the operation of the controller is governed by the roof temperature. It is set to give a power input corresponding to the lowest roof temperature at which, as found by trial, the temperature of the bath temperature is adequate for refining, and if this temperature is exceeded the switch will select the next lowest voltage tap, and so on.

A push-button control is fitted so that a higher voltage can be re-selected if the furnace has to be switched off for any reason (*e.g.*, replacement of slag) during the refining period. Switching off the controller resets the programme to the starting point, which is useful if, at the end of a melting period, a further charge has to be added.

5-ton Production Furnace Performance

The information obtained from roof temperature and heat transfer measurements can, of course, be used for manual control of an arc furnace, but the APIC will do the job automatically and with greater reliability. In fact, the use of the APIC for melting on a 5-ton production furnace at Steel, Peech & Tozer (Fig. 1), with time as the only control parameter, has resulted in an 8 per cent. increase in melting rate and a 2 per cent. saving in electricity consumption. Details of furnace performance with and without automatic power input control are given in Table 2.

The improvement in electricity consumption is less than that experienced on the 10-cwt. arc furnace with manual control of power input but it is not suggested that the present programme applied by the APIC on the 5-ton furnace is the optimum one. Also, as the 5-ton furnace is continuously operated the savings in energy consumption would be expected to be smaller.

Conclusions

The principles involved in the automatic control

FIG. 1.—EQUIPMENT FOR THE AUTOMATIC CONTROL OF POWER INPUT, INSTALLED ON THE 5-TON ARC FURNACE AT STEEL, PEECH & TOZER. IT COMPRISES A RADIATION PYROMETER SIGHTED ON THE FURNACE ROOF, A POWER INPUT CONTROLLER, AND A ROOF-TEMPERATURE RECORDER/CONTROLLER.

TABLE 2.—*5-ton Furnace Performance.*

Period.	Remarks.	No. of casts.	Charge weight range T. Cwt.	Average melting rate (ton/hr.).	Mean electricity consumption (kWh/ton).
Jan. 27 to Feb. 15, 1959 (three weeks)	Normal practice (manual control)	110	4 12 to 7 14	4.9	485
Nov. 9 to 28, 1959 (three weeks—day shifts only)	Automatic control (A.P.I.C.)	30	4 1 to 8 0	5.3	475
Percentage improvement ..	..	..	..	8	2

of power input in the electric-arc furnace have been clearly demonstrated by the performance trials on the 10-cwt. and 5-ton furnaces. In the case of the latter, the automatic power input controller is considered by the melters to be a very useful aid to efficient furnace operation and has resulted in far more consistent performance figures being obtained.

The potentialities of the APIC are fully appreciated at melting shop management level and Steel, Peech & Tozer has built its own controller, based on the BISRA prototype design, and it is to be permanently installed on the 5-ton arc furnace. It is hoped that operating experience on this furnace will be such that the company will be able to specify similar control equipment for the large arc furnaces included in its forthcoming major development scheme[4].

Acknowledgments

The author wishes to thank Dr. J. Pearson, assistant director of the British Iron and Steel Research Association, and the directors of the Steel, Peech & Tozer branch of the United Steel Companies, Limited, for their permission to publish this paper.

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[2] Ravenscroft, J., and McGee, L., *J. Iron and Steel Inst.*, **192**, May, 1959, 34–39.
[3] *J. Iron and Steel Inst.*, **192**, 37–39.
[4] *Electrical Review*, **165**, December, 1959, 828.

Quenzine Quench Oils

Quenching oils containing quenzine—a formulation of wetting oils and other ingredients developed in the US by Aldridge Industrial Oils, Incorporated—are now being made in this country and marketed by the Electric Resistance Furnace Company, Limited. The oils are claimed to give greater hardness to oil-hardening steels, to give a deeper case quicker, and with minimum distortion, oxidation, and sludging. In the initial and intermediate temperature range they have very much increased cooling power, but below 370 deg. C. the cooling rate falls rapidly to permit gradual transition to martensite, thus combining maximum hardness with minimum distortion, strain, and cracking. The oils are very economical to use, showing little, if any, deterioration over long periods of hard usage and, due to their lighter viscosity compared with other quenching oils, draining more freely from the work.

50-ton Wagon Tippler

THE machine illustrated is a large side-discharge wagon tippler of 50 tons gross capacity erected before shipment in the Erith engineering works of the General Electric Company, Limited. It has been installed as part of a development programme at the West Hartlepool works of the South Durham Steel & Iron Company, Limited.

Its purpose will be to unload coal for the coke-oven

50-TON WAGON TIPPLER MANUFACTURED BY THE GENERAL ELECTRIC COMPANY FOR THE SOUTH DURHAM STEEL & IRON COMPANY.

plant at the rate of 30 wagons/hr., at the same time weighing and recording the tonnage handled.

The order for the tippler was placed with the GEC by Birtley Engineering, Limited, sub-contractors to Gibbons Bros., Limited, for the coal-conveying section of the coke-oven plant.

THE FACIA PANEL of the Triumph TR 3 sports car is now made in Stelvetite, the sheet steel permanently covered on one side with PVC, and produced by John Summers & Sons, Limited, Shotton, Chester.

ACCORDING TO recent studies conducted by the Mexican Government through the Council on Non-renewable National Resources (Consejo de Recursos Naturales no Renovables), manganese-ore reserves in Mexico are estimated to total 7,240,000 metric tons, of which 4,200,000 tons is in the State of Jalisco. The manganese-ore reserve in the State of Zacatecas is estimated at 239,500 tons.

Forthcoming Events

APRIL 27—MAY 6

Fuel Efficiency and Power for Industry Exhibition: Daily (10 a.m. to 6 p.m.) at the Grand Hall, Olympia, London.

MAY 2

Society of Engineers: Meeting at the Geological Society, Burlington House, London, W., at 5.30 p.m. "Problems in the Launching of Black Knight," by C. E. Tharratt.

MAY 3

Institution of Plant Engineers: Meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m. "Oil Refinery Utilization of Heavy Constructional Machinery," by A. W. F. Abbott.

MAY 3-4

Society for Analytical Chemistry: Joint meeting with the Iron and Steel Institute and the Institute of Metals on "The Determination of Gases in Metals" at Denison House, 296, Vauxhall Bridge Road, London, S.W.1.

MAY 3-5

Iron and Steel Institute: Annual general meeting in London at the Royal Commonwealth Society, Northumberland Avenue, W.C.1, the Great Hall, Caxton Hall, Caxton Street, S.W.1, and Church House, Great Smith Street, S.W.1.

MAY 4

Institution of Mechanical Engineers: Meeting at 1, Birdcage Walk, Westminster, London, S.W.1, at 6 p.m. James Clayton Lecture: "The High-speed Heavy-duty Diesel Engine: its Development, Design, and Application," by Dr. Ekhart Schmidt.

MAY 4-6

Institution of Plant Engineers: Annual conference at the Grand Hotel, Scarborough.

Institution of Chemical Engineers: International symposium on distillation at the Dome, Brighton.

MAY 5

Midland Institute of Mining Engineers: Meeting at the Royal Victoria Hotel, Sheffield, at 2.30 p.m. "Fast Moving Faces," by F. Fairclough.

MAY 6

Institute of Fuel (South Wales Section): Annual general meeting at the South Wales Institute of Engineers, Park Place, Cardiff, at 6 p.m.

MAY 9-11

Institute of Welding: Spring meeting at Droitwich.

MAY 10

Sheffield University Mining Society: Annual general meeting at the Mining Lecture Theatre, St. George's Square, Sheffield 1, at 4.45 p.m., followed by "Some Developments in Mechanized Shaft Sinking," by M. B. Glossop.

Institution of Plant Engineers: Meeting at the Engineers' Club, Albert Square, Manchester, at 7.15 p.m. "The Application of New Materials to Plant Engineering," by J. Leyland.

South Staffordshire and Warwickshire Institute of Mining Engineers: Meeting at the Swan Hotel, Lichfield, at 3 p.m. "Some Observations on the Behaviour of Air Discharged from Pneumatic Stowing Ranges and Ventilation Ducts," by J. V. Spence and J. Carver.

MAY 11

Combustion Engineering Association (Southern Region): Meeting at the Great Western Hotel, Station Road, Reading, at 10.30 a.m. Discussion on "The Ability of Mechanical Stokers to Comply With Section 1 of the Clean Air Act."

MAY 18

Midland Counties Institution of Engineers: Meeting at the Mines Rescue Station, Ashby-de-la-Zouch. "The Monoveyor," by S. A. McKee.

Institution of Plant Engineers: Meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m. "Factory Safety," by a member of HM Factory Inspectorate.

MAY 19

South Wales Institute of Engineers: Meeting in Cardiff at 6 p.m. "The Aberthaw Power Station," by W. Wilde.

MAY 23

Institute of Fuel: Meeting at the Institution of Civil Engineers, Great George Street, London, S.W.1, at 5.30 p.m. "Recommendations on Heights for New Industrial Chimneys," by G. Nonhebel.

MAY 24

Institution of Plant Engineers: Meeting at the South Wales Engineers' Institute, Park Place, Cardiff, at 7.30 p.m. "Controlled Maintenance," by G. E. Halter.

MAY 27

Midland Institute of Mining Engineers: Annual dinner at the Grand Hotel, Sheffield, at 7 for 7.30 p.m.

MAY 29—JUNE 11

Iron and Steel Institute: Special meeting in Italy, including a joint meeting with the Associazione Italiano di Metallurgia in Milan on May 30 and 31.

National Association of Colliery Managers

MAY 6

Lancashire Branch: Annual meeting and dinner at the Pack Horse Hotel, Bolton.

MAY 9

Midland Branch: Annual general meeting at the Five Ways Hotel, Nottingham, at 6.30 p.m.

JUNE 1-3

Annual general meeting and conference at Southport (Lancs).

Steel Production Begins at Durgapur

PRODUCTION of steel has commenced at Durgapur steelworks, West Bengal, India, with the first open-hearth furnace in the steel melting shop going into operation on Monday. The second furnace is also ready for operation and the third one will follow in about two weeks. The furnace is of the fixed open-hearth type and of the most modern design, with a capacity of 200 tons.

Molten iron from the blast furnaces is stored in the mixer bay in two inactive hot metal mixers of 800 tons capacity each. It is taken from the mixers, in ladles, and desiliconized by the application of pure oxygen to the molten metal by means of a lance. The molten iron is brought in ladles from the desiliconizing plant and charged into the furnace. A typical charge consists of 70 to 80 per cent. molten iron and 20 to 30 per cent. steel scrap, together with small amounts of iron ore and fluxes. The furnace is fired with a mixture of coke-oven gas and creosote pitch (residue of tar distillation), both of which are produced in the by-products plant of the coke ovens.

The Durgapur steel plant will eventually have eight open-hearth furnaces, seven of 200 tons capacity and one of 100 tons capacity for the production of special steel, producing a total of 2,800 tons of steel per day. The plant has been designed to accommodate four additional furnaces at a later date. Design and construction of the open-hearth furnaces has been executed by the Wellman Smith Owen Engineering Corporation, Limited, a member company of ISCON—the British consortium of 13 leading engineering and electrical companies engaged in the construction of the steelworks.

In the seven days ended April 10, production of pig-iron from the No. 1 blast furnace at Durgapur was over 7,100 tons. This is the highest production of any week up to date and all the iron was cast on the single pig-casting machine now in operation.

Installing Shaft Equipment at Killoch Colliery

By R. CROCKETT*

No. 1 shaft at Killoch Colliery is the upcast and principal coal-winding shaft, being equipped for skipwinding. Equipping this 830-yd. deep shaft forms the subject of this paper presented to the Scottish Branch of the National Association of Colliery Managers on December 2, 1959. Detailed descriptions are given of the installation of shaft cables, guide-rope weights, sump steelwork, and the skip-measuring pockets at the 570-yd. and 770-yd. levels. Skip and balance-weight winding is to be practised, necessitating two winding engines which are both housed in a single winding tower. The construction of the plenum-type fan drift, whose roof forms part of the floor of the tower, is also described.

KILLOCH COLLIERY, the first new major sinking undertaken by the National Coal Board in Ayrshire, is situated 9 miles east of Ayr, between the villages of Coylton and Ochiltree. The colliery will be the largest in Ayrshire and will work a virgin area of 10 sq. miles in the southern part of the Mauchline Basin. It is planned to produce 5,000 to 6,000 tons of saleable output per day, winding on two shifts.

Sinking commenced in No. 1 shaft in December, 1953, and in No. 2 shaft in May, 1954. Both shafts are circular, concrete lined, and 400 ft. apart. No. 1 shaft is 24 ft. dia. and No. 2 shaft is 20 ft. dia. Each shaft has two main insets, one at the 570-yd. and one at the 770-yd. horizon. There are also two minor insets in both shafts at the 630- and 805-yd. levels. The pit-bottom circuit for the 570- and 770-yd. horizons is shown in Fig. 1.

Initially coal will be produced from the 570- and 770-yd. horizons, and when these ultimately become exhausted it is anticipated that a 900-yd. horizon will be developed. The inset at the 630-yd. horizon is in the Main Coal Seam. At present, from this inset, face room is being developed concurrently with the stone drivages in the 570-yd. horizon above. This face room will be utilized immediately the mine drivage programme at the 570-yd. horizon has been completed. Planning has been such that no time will be lost in coal development.

Sinking operations in both shafts were completed in February, 1958. From this date, inset construction, shaft connections, and the following other items were carried out:—(1) Connections between shafts at 570-yd. level; (2) formation of electrical substation at 570-yd. level; and (3) formation of lodgement and pump house together with the installation of the pump at 805-yd. level.

No. 1 shaft is the upcast and the principal coal-winding shaft and is equipped for skipwinding. The shaft is 830 yd. deep and is consequently the

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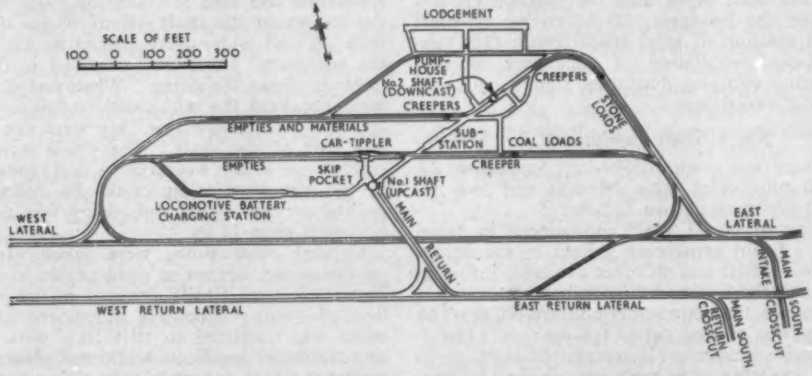


FIG. 1.—BASIC PIT-BOTTOM DESIGN FOR THE TWO COAL-PRODUCING HORIZONS AT KILLOCH COLLIERY.

larger and deeper of the two. The equipping of this shaft to deal with the planned output constitutes the main subject of this paper.

No. 2 Shaft Equipment

No. 2 shaft, which is the downcast shaft, will be used primarily for winding men, materials, and stone. The winder tower in this case is 175 ft. high, 63 ft. long, and 53 ft. wide, and is constructed of prestressed concrete. It weighs approximately 4,000 tons and carries 1,000 tons of equipment. The total load is supported on 14 columns erected on piles which were sunk to the rockhead. A four-rope friction winder with a 1,250-h.p. a.c. motor and coaxial gearbox is situated above ground level in the winder tower. The shaft has been equipped with a three-deck cage and a counterweight. The cage, of aluminium alloy construction with a steel frame, weighs 8¼ tons and is capable of carrying 150 men or two 3-ton mine cars. Winding is limited to two cars as the cage is primarily for men.

The six guide ropes are 1¼ in. dia., and are of locked-coil construction. They are arranged in twin pairs, two pairs on one side of the cage (east to west) and the third pair close to the south shaft wall for the counterweight. Eight guide shoes are fitted to the cage and take the form of aluminium slipper brackets fitted with cast-iron half bushes. The counterweight is 13.8 tons dead load, and runs on the two guide ropes nearer the south shaft wall. The twin-balance ropes fitted to the cage and counterweight are multi-round strand, non-rotating, and have a circumference of 6 in. Rope spin is compensated by thrust bearings in the rope attachments.

In connection with the equipping of the No. 2 shaft, the following programme was drawn up and carried out:—(1) Installation of cable and pipe brackets; (2) lowering of guide rope reels to 805-yd. level; (3) installation of sump steelwork; (4) installation of pump and fire-fighting range and compressed-air range; (5) installation of cables; (6) lowering of winding and balance rope reels and stripping the shaft pipes used for sinking; (7) dismantling of the headgear; (8) formation of shaft collar; (9) erection of steel guide tower; (10) raising of ropes, installation of cage and counterweight, fitting swinging platforms, signals, and gate interlocking equipment.

No. 1 Shaft Equipment

The winder was commissioned on September 29, 1958, with pit-bottom mine drivages and coal development commencing on October 5.

Equipping of No. 1 shaft commenced in January, 1959. From experience gained in the equipping of No. 2 shaft and all other available information, a very tight, but realistic, programme was agreed between the contractors and the NCB. The programme was carried out as follows:—(1) Installation of cable brackets; (2) erection of sump steelwork and lowering rope reels into shaft; (3) erection of skip-measuring pocket at 570- and 770-yd. levels; (4) installation of shaft cables; (5) dismantling of sinking headgear and scaffold and installation of temporary winding equipment; (6) excavation of shaft collar, completion of plenum for the fan drift and completion of the shaft collar and floor slab; (7) erection of internal guide tower steelwork; (8) raising and installation of guide ropes; (9) installation of skips, counterweights, winding and balance ropes; and (10) installation of shaft interlocking equipment and commissioning of winders.

Preparatory Work

The sinking scaffold which was of the conventional type, 23 ft. dia., and giving a 7-in. clearance round the perimeter of the shaft, required to be modified to permit shaft travel past the cable brackets which were about to be installed. For this purpose the scaffold was lowered to the bottom of the shaft and blocked up. Sections were removed from the east, west, and south sides, giving in these directions a clearance of approximately 18 in. Handrails were erected round these three sides for safety.

A small lodgement and pump inset was constructed in the shaft bottom. Two CP sludge pumps of 30 gal./min. capacity were installed to deal with the shaft water, which amounted to 10 gal./min. Only one of these pumps required to run at any one time, the other acted as a standby. The water was pumped 25 yd. up the shaft to the pumping station at the 805-yd. level. From here it was pumped direct to the surface via No. 2 shaft.

Accuracy to which the shaft equipment can be installed depends upon the degree of accuracy initially established in the setting of plumb lines and levels in the shaft by the surveying staff at the colliery. Every facility was granted to this department to achieve the accuracy demanded.

Four plumb lines were suspended from the surface to the bottom of the shaft. Piano wire of 18 s.w.g. was used and each wire was weighted with a 100-lb. plummet. The wires were positioned accurately at the surface. Special guide clamps made on the site were attached to the shaft wall by Rawlbolts and used to clamp or guide the wires at the bottom of the shaft. Four 40-gal. drums filled with oil and water were placed in the sump and the suspended plummets immersed in the fluid in order to damp the swing. When settled conditions were obtained the wires were inspected from top to bottom to ensure that they were not fouling in any part of the shaft. The whole operation was carried out at the weekend so that, consistent with safety, the ventilation could be reduced for a limited period. Maximum swing was found to be not more than 1¼ in.

Careful observations were taken of the wires against two scales set at right angles to each other. The wires were finally arrested in the mean position of swing. Sideways movement only of the wires was restricted so that they were kept continually under tension. Additional clamps were installed at 500-ft. intervals, thus giving a true line for the installation of cables and pipes.

For the installation of sump steelwork a similar

procedure was adopted. In this case four wires were suspended from the surface; two wires on the north-south and two on the east-west centre lines of the shaft. The sinking scaffold was made fast and rigid at the 770-yd. inset and four barrels of oil and water placed on the scaffold. The plummets were immersed in the fluid and the plumb lines were accurately lined in at the surface by theodolite from the existing surface base lines. The theodolite was set up exactly in line with the wires at this inset. This operation was repeated three times, and thereby accurate shaft centre lines were established and knife edge pins inserted into the shaft wall.

Midway between the 770-yd. level and the sump the wires were lined in by eye and checked by stringing across the shaft. Knife-edge pins were again inserted in the shaft wall. A similar procedure was carried out in the sump. Four plumb wires were then suspended from the pins at the 770-yd. inset and checked against those further down the shaft. The accuracy of the operation was within $\frac{1}{4}$ in. The wires were then clamped as before.

Wooden plugs and staples were then inserted in the shaft wall in line with the established centre lines at each platform level. Level marks were also established at each platform. By doing this no plumb lines were suspended in the shaft during actual steelwork erection. The erectors lined in all steelwork by stringing across the shaft and measuring from these fixed levels. All steelwork was checked by the NCB surveying staff to an accuracy of $\frac{1}{16}$ in. before being grouted in. A final check was made after grouting was completed.

Installation of Cable-carrying Brackets

Before the installation commenced all brackets were transported to No. 1 bank and checked. All bolts were run through a die, oiled, and checked in an insert before being sent on to the scaffold. The scaffold team consisted of six men and the work was under the supervision of a NCB surveyor, who measured off and checked each bracket for alignment and level.

Starting from the 805-yd. level, brackets were installed at 60-ft. intervals up to the 570-yd. level. From the 570-yd. level to the surface the intervals were extended to 75 ft. As work proceeded, compressed-air and water-pipe ranges used during sinking were stripped out. The normal rate of progress was six brackets per shift plus the stripping out of the sinking equipment.

The cable-carrying brackets were secured to the shaft walls by channel iron and Rawlbolts from the 805-yd. level to 570-yd. level. From the 570 inset to the surface they were bolted into cast-iron inserts cast in the wall of the shaft. These lined in perfectly and did not present any difficulty. The installation of guide rope weights then followed.

Installation of Guide Rope Weights

It was planned to install the 12 sets of guide rope weights in the shaft sump in addition to the guide rope reels. This involved a considerable amount of equipment in the sump at one time. Clearances were very limited and, to ensure that the weights were correctly positioned, the shaft wall was marked off, and small fabricated stools specially constructed for the job were arranged in position and levelled ready to receive the weights as they were sent down the shaft. Retaining clamps, $\frac{1}{4}$ in. by $2\frac{1}{2}$ in., were bolted into the shaft wall to stabilize each column of weights.

The individual weights, which had previously been assembled at the surface, cleaned and scrubbed with a wire brush, are 25 in. dia. and weigh 532 lb. Each one has a $\frac{1}{2}$-in. recess with a $\frac{1}{2}$-in. spike and a centre hole of $2\frac{7}{16}$ in. dia. They are not the slotted type and cannot therefore be slipped on to the retaining rods.

The loading of the individual ropes in the shaft was calculated as shown in Table 1.

TABLE 1.—*Calculated Loading of the Individual Ropes in the Shaft.*

	No. 1A winder.	No. 1B winder.
South	7 tons	7 tons
Inner South	6 ,,	6 ,,
North	7 ,,	7 ,,
Inner North	6.5 ,,	6.5 ,,
Counterbalance:		
East	6 tons	7 tons
West	7 ,,	6 ,,

A load of 7 tons comprises some 30 weights, and the total weight installed in the shaft was approximately 80 tons.

With the sinking scaffold made fast about 40 ft. above sump level, guide weights were lowered by the winder into the shaft bottom in groups of eight. These were placed directly on the stools and were erected as fast as the winder could deliver them into the sump. During erection each group of weights was checked with a "progger" to maintain verticality. When a dozen weights or so had been built up on each group, tubular scaffolding and flooring were erected. The operation was continued until the weights were 25 ft. high. At this stage the weights were fastened to the shaft wall by means of $\frac{1}{2}$-in. clamps.

The remaining five weights in each of the 7-ton groups were set individually, using a special sling which gripped the dowel holes in the weight and allowed it to be set neatly on top of the pile. Careful checking with the "progger" was continued during the whole of this operation, and when the suspension rods were lowered through the weights they fitted easily. The rods were 11 ft. 9 in. long and $2\frac{1}{2}$ in. dia. The stools on which each group of weights were erected provided sufficient clearance from the sump floor to allow the fitting of plates, nuts, and locking pins on the end of the rods.

Lowering the Guide Rope Reels

When the installation of the weight was completed the tubular scaffolding and platform was removed and six pairs of 7-ft. by 6-in. by 5-in. steel joists were lowered into the sump and placed in predetermined positions ready to receive the first six guide rope reels.

While the sump was being prepared the reels were moved into correct positions at No. 1 bank, numbered as required and set up in line in 6-in. by 3-in. channels. The channels were graded forward to the scaffold doors and each reel scotched with timber wedges until required.

The weight of each reel was approximately 11 tons and before lowering this heavy load, 8 cwt. was added to the brake weights of the sinking winder.

A load of 3 cwt. was also added to the accumulators to raise the oil pressure from 80 to 100 lb./sq. in. to overcome the additional weight of the brake and to ensure that the brakes were allowed to return to the full "off" position. A mechanic and an electrician were in constant attendance at the winder over the whole of the lowering period.

A special stirrup which had been designed and constructed for lowering the rope reels was used. The reels were run forward to the shaft top doors and on to short sections of steel joists. The stirrup was then securely fixed to the reel and the total load lifted by the winder. After the brakes had been checked the joists were withdrawn and the drum lowered into the shaft. During the period the drums were being lowered, the sump crew of six men remained in the 805-yd. inset where the sinking scaffold was positioned. Telephone communication was maintained from this level to the bank.

The reels were stopped short of the sinking scaffold, guided through the scaffold doors as clearance was very limited, and as they were lowered into the sump they were placed in their respective positions by the sump crew. They were then clad over with 4-in. timber to prevent any damage to the ropes from objects accidentally falling into the sump. Lowering of ropes took 1 hr.; then followed the erection of the sump steelwork.

Erection of Sump Steelwork

Sump steelwork comprises the following platforms:—Guide rope and counterweight inspection; balance rope loop inspection; three for bumper beam inspection; three for receiver guide inspection; two for taper guide inspection; inset access to measuring pocket and the inset floor. The first platform of the sump steelwork is 15 ft. above the floor of the sump.

It will be used for the inspection of guide rope weights and suspension gear, but since it was necessary to use this platform for the support of six guide rope reels, additional stanchions were erected from the floor of the sump to provide additional temporary support. The remaining six guide rope drums were then lowered and installed in their predetermined positions on this platform. As before, they were clad over with timber to prevent any positive damage. The placing of these reels in the shaft had to be accurate, as will be seen later.

When the platform at 805-yd. level had been completed four pairs of pedestals and bearings were erected on heavy section steel joists ready to receive the balance ropes. The balance rope reels were lowered and set up on this frame ready for unreeling. Again the drums were clad over for protection.

The remaining platforms to the 770-yd. level were now erected. Each platform, which had been pre-erected on the site, consisted of some 30 numbered pieces of steelwork and the total time allowed in the schedule for completion was 24 hr. per platform. This included lowering materials to the sinking scaffold, then lowering by compressed-air winch to site, erection, lining up, levelling and checking, shuttering and grouting, and erection of tubular scaffolding to next platform. All steelwork was laid out on No. 1 bank in the order in which it was required. Contractors were responsible for the erection of shaft steelwork and the NCB for installing of the rope reels and conveyance of all steelwork to the site of erection. When all platforms had been completed the eight winder rope reels were lowered and positioned in the 770-yd. main deck platform.

The actual time taken for this phase of the work was 19 days.

Erection of 770 and 570 Skip-measuring Pockets

Erection of the 770 skip-measuring pocket (Fig. 2) was fairly straightforward. Steelwork was delivered to the contractors by the NCB direct to the sinking scaffold, from where it was picked up by a compressed-air winch and lifted into position for erection.

The measuring pocket is 18 tons capacity and is fabricated from $\frac{5}{16}$-in. steel plate with 3-in. by 3-in. by $\frac{1}{2}$-in. corner angles and is fitted with timber-backed wear plates. At the top it is fitted with an anti-breakage plate and a guillotine-type airlock door, and at the bottom with an airlock discharge door of the quadrant type. The airlock doors will be pneumatically operated and interlocked to prevent both operating simultaneously.

The hopper is suspended on two arms extending from the weighing machine to provide automatic weighing of the quantity of coal delivered into the measuring pocket. When the correct weight of material is in the hopper the weigh arms operate a pneumatic control to stop the plate feeder and close the top airlock doors.

A transfer chute to convey the coal from the measuring pocket to the skip is fabricated from $\frac{5}{16}$-in. mild-steel plate and is also provided with timber-backed steel wearing plates.

This transfer chute is fitted with an anti-spillage chute which will engage with an anti-spillage device fitted on the skip. The 570 level skip-measuring pocket was erected in much the same way as at the 770 level. This measuring pocket differs only in that it has a double hopper of 36 tons capacity with provision for the fitting of a transfer chute.

Electro-pneumatic control and fully interlocking safety circuits are provided for operating the skip at both measuring pockets and at both coal- and man-decking levels.

Installation of Shaft Cables

During this phase of the work cables were installed in No. 1 shaft as follow:—Power cable

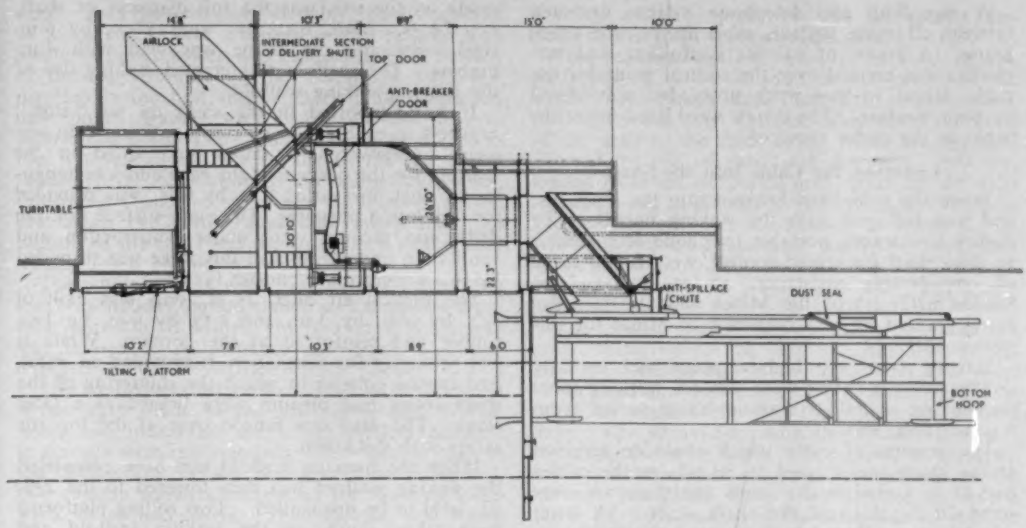


FIG. 2.—SKIP-MEASURING POCKET AT THE 770-YD. HORIZON.

(6,600 V) to the 570 level; power cable (6,600-V) to 770 level; telephone cable to the 570 level; telephone cable to the 770 level; 1A winder-signal cable; 1A gate and shaft interlocking cable; 1B winder-signal cable; 1B gate and shaft interlocking cable.

Owing to the length of cable involved the power, telephone, signal, and gate and shaft interlocking cables to the 770-yd. level were installed in two lengths, *i.e.*, surface to 570- and 570- to 770-yd. levels. No junction boxes were used in the shaft.

As there is a temporary inset for man-winding at the 630-yd. level the signal and gate and shaft interlocking cables for No. 1A winder are installed between the 570- and 630-yd. insets. Similar power and telephone cables have been installed in No. 2 shaft.

The cable entrances to each shaft are connected by separate tunnels to the main colliery substation, the power cables from the station to the 570-yd. level being installed in one length. The tunnels are 128 ft. and 330 ft. long, respectively, and 6 ft. by 4 ft. in cross-section. They are constructed of brick sidewalls with a concrete roof. Adequate lighting and drainage are provided and there are eight sets of cable-carrying brackets on either wall, each bracket capable of carrying several cables.

High-tension cables have been separated from medium- and low-tension cables and ample provision has been made for the future requirements of the colliery.

The cables from the surface to the 570-yd. level are situated in the east and south side of the shaft. Those from the 570- to the 770-level are situated in the east and west side.

The cable cleat fixings are made of elm hardwood with lengths from 3 ft. 6 in. for power cables to 2 ft. 6 in. for signal cables and are bolted with galvanized strips (6-in. by ¼-in. flat bar) to the fixing bars.

The cast-iron inserts referred to were inserted flush with the shaft wall during sinking and are tapped for a 1¼-in. screw. Where these had been installed the cable cleat bar fixings were inserted at 75-ft. intervals. Other parts of the shaft were drilled with Rawlbolts, fixings being inserted at 60-ft. intervals.

As the signals and gate and shaft interlocking cables were required immediately the sinking winder had been removed and before the permanent winders were commissioned, it was decided to make use of the sinking scaffold and winder in the installation of these cables. Power and telephone cables would be installed later using the permanent winder. The usual method of mounting the drum at the surface and lowering the cable lashed to a steel rope was adopted. This method was found most suitable because of the drum capacity of sinking winch and the size of cable drums to be handled.

The cable lowering winch was compressed-air operated and was located some 100 ft. to the east of No. 1 shaft. The 6-ft. dia. rope pulley wheel was mounted on a girder frame spanning the shaft and was capable of supporting 12 tons. The cable wheel was simply an old Clifton wheel of 5 ft. 6 in. dia. fitted with shaped wooden pads and mounted at right angles to the drum of the winch. An existing platform 14 ft. below ground level was used when lashing the cable to the rope. The cable was lashed at intervals of 11 ft. and an intermediate tying made between each lashing without stopping the winch. A locked-coil rope of 1¼ in. dia. was used for lowering.

A signalling and telephone system operated between all insets, surface, cable drums, and winch house. A frame of tubular scaffolding and tarpaulins was erected over the control point for the cable drums so that work proceeded unhindered by poor weather. The drums were lined up at the bank in the order required.

Lowering the Cable into the Shaft

When the cable was lowered into the shaft, the end was followed with the sinking hoppit. To ensure free travel, portable telephone sets, similar to those used for crowd control, were found to be of considerable assistance, an exemption from Section 67(2) (*c*) of the Mines and Quarries Act being granted by HM Inspector of Mines for this instrument.

Starting from the highest point and working downwards the cables were cleated, working from the sinking scaffold. Scaffold travel varied from 9 ft. to 15 in./min.

The amount of cable which could be received at the insets was limited to 30 yd., as the cables had to be coiled in the insets and these are only some 20 ft. clear of the shaft walls. A strict schedule was adhered to throughout the operation. On the surface five labourers were employed for cable handling. At the insets 15 men received and coiled the surplus cable. When not required these men were engaged in other work.

The installation, carried out jointly with an outside contractor and Area and colliery officials, was finished 18 hr. ahead of schedule.

After a week a final check was made on the tightness of all cable cleats. This completed the cable lowering operation for the time being, but a further six power and telephone cables will be installed later.

Dismantling Sinking Headgear and Winder Scaffold

The existing winding arrangements were the sinking scaffold and hoppit, the scaffold being lowered to either of the shaft insets as required. The hoppit was capable of carrying eight men. This arrangement had to be replaced by a temporary mobile winder until the 1A winder and skip had been installed and commissioned. The cage for the mobile winder is of very light construction and is capable of carrying four men.

A concrete slab measuring 28 ft. by 10 ft. was prepared on the east side of No. 1 tower as a base for the winder. This position was selected as being the most suitable because the winder would not interfere with other work still to be completed. From this site a clear rope run to the headgear pulley on the bumper beam platform free of the guide tower steelwork was also obtained.

As the existing shaft collar, shaft-top doors, and ancillary equipment had to be removed and two main centre concrete beams in the tower were still in the course of construction, banking of men was prevented above ground level. It was, therefore, necessary to install a temporary banking scaffold in the shaft 30 ft. below ground level. This scaffold, made on the site, was the full diameter of shaft, *i.e.*, 24 ft. Main members were 12-in. by 6-in. steel joists and the frame was clad with 4-in. timbers. The scaffold was erected making use of the existing sinking scaffold.

It was supported in the shaft on six "stob" brackets to enable it to be easily withdrawn in one piece. Galloway-type doors were fitted in the scaffold for the passage of the cage and a rectangular air duct, measuring 8 ft. by 6 ft., was provided for ventilation purposes. The main surface fan, fan drift, and plenum were under construction and ventilation underground at this stage was provided by two underground booster fans.

The vertical air duct, 27 ft. long, was built of 8-ft. by 6-in. by 3-in. and 6-ft. by 6-in. by 3-in. timber and reinforced at the corners. While it was primarily for ventilation, it provided an excellent central column to which the shuttering of the shaft collar and plenum were braced at a later stage. The duct was fenced over at the top for safety with weldmesh.

When the banking scaffold had been completed the sinking scaffold was then lowered to the 770-yd. level to be dismantled. Two rolling platforms were taken down on the sinking scaffold and erected on the east side of the 570-yd. and 630-yd. insets. Concrete foundations had been already prepared for them at these points. The platforms are in the form of running gangways, 2 ft. wide, which can be lowered out into the shaft, to allow the emergency cage to be boarded from the insets. A small hand winch is used for lowering and raising these platforms.

The sinking scaffold was blocked up on the top platform of the shaft steelwork at the 770-yd. inset and dismantled into four sections and sent to the surface. The oxyacetylene burner was used to advantage on this operation. The last hoppit was raised from the shaft and the winding chains and detaching gear were then lowered on to a bogie for removal. The winding rope capel was then attached to a small air winch which had been installed within the tower and the winding rope was lowered over the headframe to ground level.

Dismantling in Stages

Following this, the scaffold winch ropes with bull chains and suspension gear were raised to the surface. The suspension gear was first lowered on to bogies and taken off and the ropes were lowered over the headframe as before. The sinking headgear was now stripped ready for dismantling by an outside contractor. The headframe had been completely clad with galvanized sheeting during the erection of the tower to prevent material falling into the shaft, but during the previous weekend this was stripped off and numbered. Before dismantling commenced all combustible material was cleaned up as far as possible within the area of the tower and the floor covered with zinc sheeting and a layer of sand. An adequate water supply, fire-fighting hose, and fire extinguishers were available.

To facilitate the installation of the emergency

winder with the least possible delay, the dismantling of the headgear was arranged in two stages. The headgear pulley wheels and platforms and a portion of the top structure of the headframe were dismantled in the first stage. During this operation new pulley frames were being erected in predetermined positions on bumper beam platforms in No. 1 tower to suit the raising of the first guide ropes and the installation of the emergency winder. Following immediately on the completion of the first stage, two guide ropes were raised from the bottom of the shaft and the emergency winder and its associated equipment was installed.

The whole of this work was carried out during the May holiday period under an exemption from HM Inspector of Mines. Manpower underground was limited to maintenance and safety and men engaged on the installation of the ropes.

The winder was fully tested at all levels. Several winds were made to the 570-, 630-, and 770-yd. levels and indicators and safety devices adjusted to comply with requirements. The second stage in the dismantling of the headgear then proceeded, two capstan winches being used for lowering steelwork to ground levels. This material was transported to a site on the north side of the tower by crane and traxcavator manned by NCB operators. The contractor loaded from here on to lorries and sent the steelwork off the site. Guide and winding ropes extending up through the headframe handicapped with work to a certain extent, but satisfactory progress was made without mishap to men or equipment.

When the deck had finally been cleared of all steelwork, work was started on the shaft-top doors and supporting structure. All steelwork was burned out and lifted from the shaft by the sinking winch and the mobile crane. The shaft top was then completely stripped down to the banking scaffold, fenced off, and made ready for the demolition of the existing shaft collar.

Construction of New Shaft Collar

The four centre legs of the sinking headframe had been sited on the original shaft collar when No. 1 shaft was sunk. This collar was approximately 30 ft. from north to south and 36 ft. from east to west and was constructed of reinforced concrete 3 ft. thick.

The fan housing situated due west of the tower is connected to the shaft by means of a reinforced concrete drift, at a level 15 ft. below the floor slab of the No. 1 tower. The drift is 12 ft. 6 in. high and 16 ft. wide and approaches the west wall of the tower dipping at a very shallow angle levelling out as it joins the side walls some 72 ft. 6 in. from the centre line of the shaft. The roof of the drift forms part of the floor of the tower. It had been found possible to complete the drift with safety to within 9 ft. of the shaft wall. It was now necessary to excavate round the shaft and prepare for the construction of the shaft collar and the plenum, the vital connection between the drift and the shaft. This work was in the hands of civil engineering contractors and the first steps taken were to make arrangements for the speedy disposal of soil from the excavated area.

The banking scaffold already installed in the shaft proved to be an asset in this phase of the work. Two ramps were built, one at the outbye end of the fan drift and the other from the floor of the drift to the shaft collar. This arrangement allowed the use of two 1-ton dumpers. Soil was loaded from the excavated area, taken up the drift and deposited at ground level where it was dumped and levelled out with a bulldozer as required. In addition, soil was excavated from the south side of the shaft with a Priestman crane and a 1-cub. yd. bucket. The debris was tipped into lorries and taken off the site.

The actual volume of the excavation was not great, being about 120 cub. yd., but 3 ft. of reinforced concrete had to be demolished over most of the area and this presented difficulties. The time taken to prepare the site for shuttering was 12 days. The excavation, with the boulder clay surrounding the shaft walls, was stepped to maintain 1 ft. 6 in. minimum thickness of concrete on the curve. The shaft walls were stepped to suit a curve of 9 ft. radius at the west side to zero at the east side of the shaft.

Manning and Equipment

During the demolition and excavation, 12-hr. shifts were worked, demolition being done mostly on the night shift and disposal of spoil on the day shift. Day shift consisted of two foremen and 24 labourers; night shift comprised two foremen and 12 labourers. The contractor's site agent supervised part of both shifts. The equipment used in addition to dumpers, bulldozer, and crane was three sludge pumps, 12 90-lb. concrete breakers, four drilling machines, and 12 sets of plugs and feathers.

Preparation of Shuttering

The shuttering required to construct three vertical aerofoil sections intersecting a funnel of varying radii was very complex and a high degree of accuracy was necessary in its preparation. The use of the colliery clocking hall, which at this stage was not in commission, was granted to the contractors to enable them to make and erect the shuttering on the site. The hall which is 45 ft. by 37 ft. gave ample flat floor space and proved ideal for the purpose.

The shaft section and the working radii for the connecting funnel were marked off on the floor of the hall. Working to these dimensions the shuttering was built up in unit sections to a height that included the junctions of the aerofoils and funnels. All shuttering was carefully checked throughout the construction and numbered before being dismantled into unit sections.

The care taken in the preparation of the shuttering paid dividends and the erection on the site was fairly straightforward. In order to form a smooth curve from the floor of the fan drift to the shaft wall the shuttering for the first pour was erected up to and including the whole of the curve and the

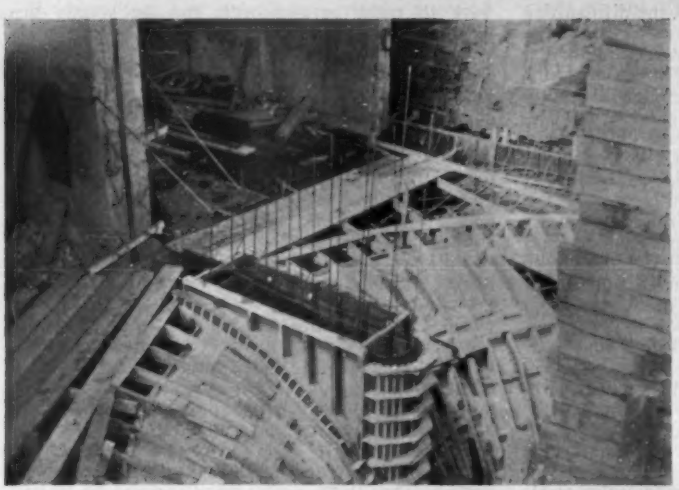


FIG. 3.—ERECTION OF SHUTTERING FROM THE FLOOR OF THE FAN DRIFT TO THE SHAFT WALL.

junctions where the aerofoil intersected it (Fig. 3).

Acrow scaffolding was used for the staging and supporting structure and, being adjustable, small discrepancies were easily remedied. To support the overhang on the curve the shuttering was braced to the sides of the large rectangular air duct previously described. The duct extended from the scaffold to the surface.

The first set of shuttering was the most difficult to construct and erect. The remainder included the extension of the fan drift side walls to surround the shaft and complete the seal to the underside of the tower floor. The aerofoil was raised to the full height of the fan drift in three stages.

Pouring of Concrete

Sited on the south side of the tower, two concrete mixers of 2 cub. yd. capacity were used for the mixing. The two dumpers and the crane used in excavation work were also employed in the transportation of the concrete. During the pouring of the concrete, vibrators were used continuously. For the first pour which was the most difficult the concrete was placed, working from west to east of the shaft. Access holes were left in the shuttering to enable levels to be checked as the pouring continued. The first stage involving the plenum and the intersection of the aerofoil required 14 hr. continuous pouring. Two more pours of 12 hr. each completed the fan drift walls surrounding the shaft to the underside of the tower floor. Altogether, setting the shuttering and placing the concrete took 12 days.

The whole operation took five weeks to complete, 12 days being spent on excavation and 12 days on shuttering and concreting. The remaining period was required for preparation of shuttering, steelfixing, erection of staging and scaffolding, and stripping of shuttering and clearing the site.

Before the erection of ground frame and internal steelwork began, the temporary scaffold which had been erected in the shaft had to be removed. The temporary air duct was, therefore, dismantled and the emergency winder cage raised to a suitable position in the tower well above ground level. This work was carried out on a Saturday afternoon when no workmen were underground. The scaffold, estimated at 4 tons weight, was raised slightly off the stob brackets by two compressed-air winches rigged for lifting 20 tons.

When the scaffold had been freely suspended the stob brackets on which it had been resting were burned out flush with the shaft wall.

The stob brackets were attached to the scaffold by long bolts to prevent them falling down the shaft when cut.

When burning was completed the scaffold was lifted in one piece to a point above ground level; a winch situated on the east side of the tower was used to pull it out of the shaft. Difficulty arose due to the presence of two guide ropes passing through the cage entrance in the scaffold, and a slot had to be cut to allow the scaffold to be drawn clear of the shaft. As part of the scaffold overhung the open shaft the cutting of the slot was a rather difficult task. Safety harness was used and part of a trawl net, which had been obtained from a ship chandlers for the erection of the ground frame, was roped across the open shaft to give added safety and confidence to the men engaged in this work. The job was completed without mishap and allowed the erection of the ground frame to proceed.

Erection of Ground Frame and Tower Steelwork

The steelwork for the ground frame and shaft top doors and internal guide tower steelwork was pre-erected on the site and checked before being transported to No. 1 tower (Fig. 4). The tower steelwork is 110 ft. from ground level to the underside of the auxiliary floor, and was erected in three sections. These sections are framed by the central beams of the tower and are 33 ft., 26 ft., and 51 ft., respectively. In the construction, the contractors started on the top section and erected vertically downwards.

The presence of the guide ropes in the shaft prevented the ground frame from being installed in one piece. It had therefore to be erected in sections across the open shaft. As a safety precaution the trawl net was retained in position across the open shaft a few feet below ground level. The steel erectors were also equipped with

parachute-type safety harness, which is light and easy to work with. Hand lines were attached to a ½-in. rope, which was tensioned across the shaft.

The emergency winder occupied the east entrance to the tower, and steel had to be taken into the shaft by the only other available access on the south side. Unfortunately, it was not possible to use the crane on this side of the tower and rails had therefore to be laid forward from the steelyard outside the tower to the shaft collar. Steel sections were loaded by crane on to bogies and trammed a short distance to the shaft collar. At this point, they were picked up by the compressed-air erection winches and lowered into position.

When the frame had been completed, it was accurately lined and levelled by the surveying staff at the colliery. The shaft-top doors were then installed in position, safety net withdrawn, a complete steel frame now covering the shaft.

The first section of the tower steelwork extended from the underside of the auxiliary floor to the first centre beams of the tower structure beneath, which are 76 ft. above ground level. This section comprises the bumper beams (Fig. 5), supporting structure for the skip and counterweight drop-back catches, and taper guides. Eight drop-back catches are provided for each skip and four to each counterweight. These are arranged in pairs on the east and west sides of the shaft and there are two sets 10 ft. apart. The taper guides are identical to those installed in the shaft.

Heavy compound steel beams were used throughout, and the erection of this section was most difficult because of the lack of headroom. The presence of guide ropes and the winding rope of the emergency winder added further complications. Progress on this section was not up to standard and the scheduled time was exceeded by a few days.

The intermediate section which is mainly for the receiver guides and banksman's cabin was more straightforward and, with the lower section of the tower, was completed according to schedule.

The lower section, which is 51 ft. high, contains six vertical columns, three on the north and three on the south side of the shaft. Both east and west sides were left open for the installation of the skip and for skip changing. The north side columns provide the supporting structure for the skip discharge chutes.

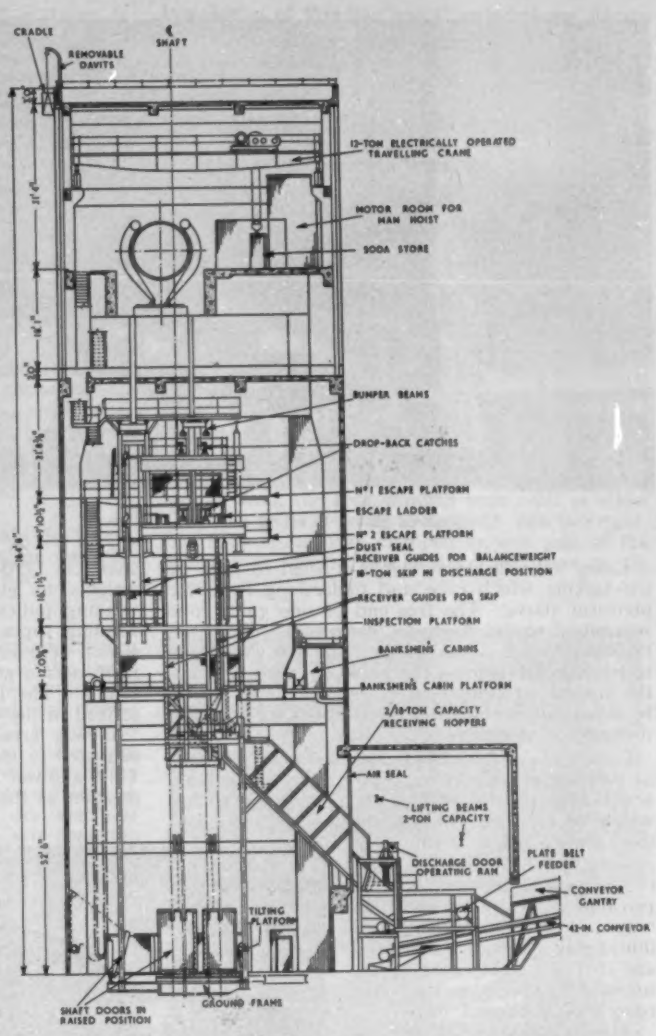


FIG. 4.—SECTIONAL DRAWING OF THE SKIPWINDING TOWER.

Raising of Guide Ropes

The guide ropes were raised individually from their positions in the sump by means of the sinking winch rope, double-rope clamps being used. Clamping positions were clearly marked on the sinking winch rope. They were arranged so that the leading end of each guide rope was 5 ft. through the suspension capel on the bumper beam floor when the main carrying clamps were 3 ft. above collar frame level.

FIG. 5.—BUMPER BEAM PLATFORM IN NO. 1 TOWER.

Using a bridle, each reel was lifted in turn by the sinking winch rope and underslung from the platform above. The free end of one guide rope was raised to the clamping platform 151 ft. above the sump by a small air winch. The first clamp was then secured. Due to the maze of steelwork and the amount of equipment in the shaft, care had to be taken in plumbing the correct path for the rope through the steelwork.

Clamps were attached at the clamping platform as both ropes were raised in stages by the sinking winch. The final set of four clamps carried the full weight of the rope. On reaching the surface each clamp was removed in turn and the guide rope threaded through the suspension capel by a small air winch. The guide rope was thoroughly cleaned and capped and its full weight taken by the suspension capel when the winch rope was slackened off.

After a period of half an hour all clamps were removed and the sinking winch rope returned for the next lift. In all, 10 ropes were raised during this phase and the speed of the operation was one rope per shift. In lowering and raising the rope, 5 hr. of the shift were utilized. Progress was considered satisfactory.

Installation of Skip Hoisting Gear

No. 1 shaft is equipped with two winders of similar design (Fig. 6). They are multi-rope friction-type winders with co-axial gearboxes and have 1,875-h.p. a.c. electric motors. Each winder is equipped with one 18-ton tare skip and is capable of carrying 30 men on the manriding deck, one 27-ton counterweight, four winding ropes, and two balance ropes.

The following detailed preparatory work was necessary beforehand:—(*a*) Fitting of brakes to rope drums; (*b*) fitting dry cones fixings on winding ropes; (*c*) removing cleading from winding drums; (*d*) fitting white-metal cones and capels on balance ropes; (*e*) lowering and fitting balance rope capels; (*f*) lowering and fitting guide rope capels; (*g*) dismantling, cleaning, greasing, and lowering skip suspension gear; (*h*) preparing girders for resting skip in shaft at 770-yd. level; (*i*) fitting guide rope weights to guide ropes; (*j*) positioning sinking winding pulley at bumper beam level in line of winding ropes; (*k*) installing air winch with rope snatch at bumper beam level; (*l*) erection of platform across guide steelwork 24 ft. below bumper beams. The installation of the equipment is described in the order in which it was carried out.

It was arranged that No. 1A skip would be delivered to the colliery by road on a low loader. This allowed it to be unloaded in a suitable position at the shaft top. The emergency winder

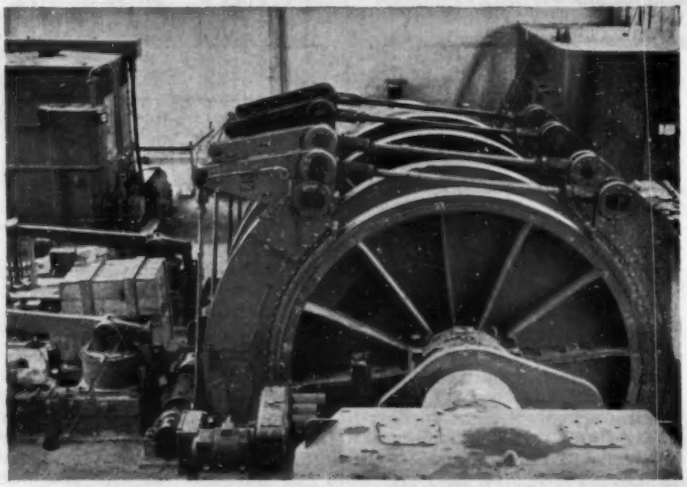


FIG. 6.—NO. 1 TOWER-MOUNTED FRICTION WINDERS.

had to be withdrawn from the east entrance to the tower, an exemption for which was granted by HM Inspector of Mines. This work was arranged for a Saturday afternoon when no mine drivage or coal development was in progress.

The emergency winder was towed off its concrete slab by a traxcavator, and the truck carrying the skip, was backed into the tower entrance, lifting ropes having been attached to the skip shortly after its arrival. In the tower the skip was lifted off the truck using the tower crane and a compressed-air winch jointly capable of lifting 45 tons. The skip, which is 38 ft. by 10 ft. by 5 ft., was unloaded, lying horizontally east and west within the north side of the tower. This operation commenced at 1 p.m. and was completed at 4.30 p.m. with the emergency winder back in position.

Using two cranes, the counterweight frame was unloaded from the truck at the south side entrance of the tower. It was lowered on to two steel bogies and trammed into the tower. From here it was picked up by the erection winches and installed in the steelwork and suspended by steel joists with the underside of the frame positioned 21 ft. 5 in. from collar frame level.

Balance weights were then fitted into the frame, which was slotted to suit them, bringing the total weight of the counter balance to 27 tons.

Installation of Skip

The skip had to be raised to a vertical position and transferred from the north side of the tower round to the west side. Using the tower crane and a compressed-air winch it was raised and moved forward to a position where it could be handled with the skip-changing trolley. The trolley runs on rails in the tower and is capable of lifting 20 tons. When the skip was suspended freely on the trolley it was drawn across to the west side of the shaft and lowered on to the skip-changing bogie. From here is was run over the shaft top doors and attached to the capel of the sinking winch rope. A special apex plate which had been made for lowering was fitted to the skip. The guide shoes were then attached to the guide ropes and the skip was now ready for lowering.

Owing to the heavy load of the skip, special care had been exercized in booking the sinking winch rope in preparation for lowering. A 2-ton weight was attached to the capel during booking. This gave smooth running of the skip as it was being lowered, an important factor when lowering a load of 18 tons on a single 1¼-in. dia. rope. The normal speed of the sinking winch was 12 ft./min., but this was reduced to 6 ft./min. as a precautionary measure.

When the skip arrived at the 770-yd. level a team of shaftsmen supported it on the skip guide steelwork by two beams. The skip remained in this position until the winding and balance ropes had been installed. The capped balance ropes were then raised from the 805-yd. platform by a small compressed-air winch and attached to the suspension gear on the underside of the skip.

Installation of Winding and Counterbalance Ropes

With the counterweight and skip in position the raising of the ropes commenced. The four winder ropes were raised first, followed by the two counterbalance ropes. The winder ropes were raised with the sinking winch using a 1¼-in. dia. locked-coil rope.

The distance from the shaft-top doors over the winder drums and back to the rope attachment on the counterweight suspension gear was calculated at 216 ft. 2½ in. The sinking winch rope was clearly marked by tape at points 24 ft., 70 ft., 135 ft., and 210 ft. from the eye of the capel. These points indicated the positions of the rope clamps and the main carrying beam. All clamps were attached to the winch rope on the 2,338-ft. platform in the shaft which is approximately 151 ft. above the floor of the sump. Therefore, when the winch rope was lowered into the shaft 59 ft. of rope had to be coiled in the sump to bring the position of the first clamp bar opposite the clamping platforms.

At the 210-ft. mark the first clamping bar was attached to the winch rope and sufficient slack was wound from the four winding rope reels to allow the ropes to be attached to the bar. The two right-hand lay ropes were clamped on one side of the winch rope and the two left-hand lay ropes on the other.

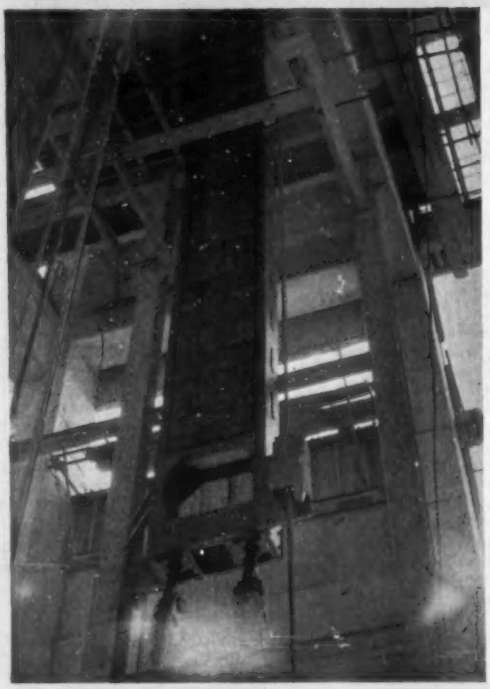


FIG. 7.—COUNTERWEIGHT FRAME SUSPENDED IN TOWER STEELWORK.

The winch rope was then raised in stages and clamping bars attached at the predetermined positions. Finally, the main lifting beam was attached to the capel of the winch rope. At this point four clamps were attached to each rope and were made to rest on the main lifting beam. The weight of each winder rope was approximately 5 tons.

All clamps and clamping positions were thoroughly cleaned before fitting and clamps tightened on the ropes by a torque spanner set at 340 lb.-ft. When clamping was complete the ropes were raised to the surface at approximately 12 ft./min., rope drums being braked as required.

When the first clamp arrived at the surface it was released from the rope of the sinking winch and attached to the rope of the air winch which had been installed at ground level with a snatch block under the bumper beam floor. The air winch and sinking winch ropes were now raised simultaneously and each clamping bar removed from the sinking winch rope and attached to the air winch rope as it arrived at the shaft top doors.

On reaching the platform erected on the guide tower steelwork the first clamping bar was removed and the individual winding ropes were fed through to the auxiliary floor level past the pulley framework in the bumper beam floor. On the auxiliary floor a clamping bar was fitted and attached to the hook of the tower crane. Lifting the ropes then continued until sufficient slack had been drawn over the winder drum to allow each rope to be capped on the winder floor. When the ropes had been capped they were lowered to the auxiliary floor and attached to the counterweight suspension gear, which was supported over the rope openings in the auxiliary floor.

Suspending the Counterweight

Before lowering the ropes and suspension gear, to couple with the counterweight, the shaft-top doors were opened to permit the rider and the main carrying beam to pass through. When the suspension gear had been coupled to the counterweight, the winder drum brake was released and the winch rope was slackened off to allow the full weight of the four winding ropes to be taken by the counterweight (Fig. 7). The clamps, the main lifting beam and the rider were then removed.

Underground, the winder ropes remaining on the reels were uncoiled and the free ends lowered down the shaft. Each rope was tensioned by means of a dynamometer to 6,600 lb. before cutting. The ropes were then capped and attached to the skip suspension gear.

On the surface the winding drum was turned sufficiently to allow the counterweight to be raised for the steel joist support to be removed. The skip was then raised slightly and the supporting beams withdrawn and placed in the inset until required for the support of 1B skip.

The skip was then raised to the surface, bringing the balance ropes with it, balance rope reels being braked as required. When the counterweight, complete with the balance rope suspension gear, reached a suitable position in the receiver guides in the shaft bottom, the skip was stopped. The remainder of the balance ropes were then uncoiled from the reels, laced through the shaft steelwork, measured, cut, and capped in the 805-yd. level. They were then raised with an air winch to the underside of the counterweight and attached to the suspension gear. The

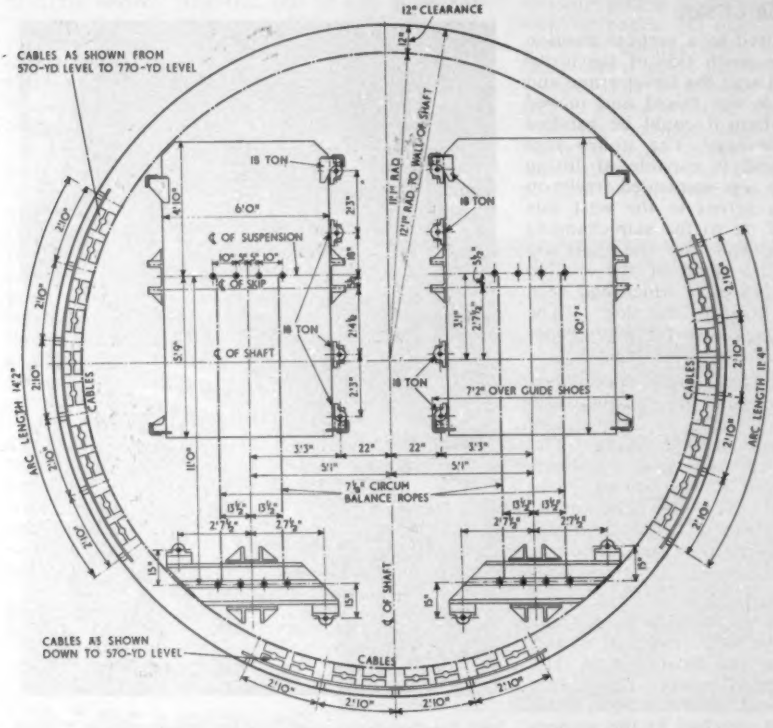


FIG. 8.—POSITION OF SKIPS, COUNTERWEIGHTS, AND CABLES IN NO. 1 SHAFT.

position of the counterweight, skips, and cables in No. 1 shaft is shown in Fig. 8.

An exemption was obtained for the use of oxy-acetylene and propane gas in the shaft. During the capping of winding and balance ropes an appointed person was in charge to ensure that precautions were observed. As laid down in the terms of the exemption, methanometer readings were taken, and firefighting arrangements and patrolling strictly observed.

The equipment for No. 1B winder has been installed in the same fashion, but cannot be completed until the emergency winder has been removed. Removal of the emergency winder will not be possible until No. 1A winder has been commissioned.

Commissioning No. 1A Winder

After the ropes had been installed the next move was to carry out tests and adjustments on the brakes and Lilley controller so that the winder would be available for carrying men through the shaft. At these tests manufacturer's representatives and NCB Area officials were present.

The over-wind position was secured by trip switch on the Lilley controller and backed up by the switch on the headgear, all to predetermined settings. This was followed by introducing the "creep" compensation device which is designed to adjust the settings of the controller and depth indicator when rope slip takes place.

The Lilley controller was then brought into full operation so that the total wind was "shadowed" to ensure adequate protection for both men and mineral handling. This involved the shaping of the decelerating cams to a certain profile, adjusting governors, indicators, and brakes. When this had been done a series of speed tests was carried out.

An artificial landing was established a safe distance from the shaft bottom. The empty skip was caused to descend from starting points varying between 2 ft. and 900 ft. above this landing. At a point within this range the distance from the artificial landing had to be great enough to allow the winder to accelerate to a trip speed coinciding with the full winder speed. Only on one occasion during these tests was the artificial landing exceeded (from 2 ft. above) and that at a speed very much less than the maximum permitted in the special code for friction winders. During the operation adjustments were made to the brakes to ensure reasonable retardation throughout. The same tests were repeated with the counterweight descending to the artificial landing and on all tests a current of approximately 200 A was applied to the motor, which is 50 per cent. in excess of full power.

At a later date the same tests will be carried out with the skip loaded equivalent to a full complement of men and a full load of mineral.

Signal, shaft, and gate interlocking equipment is at present being installed to complete the commissioning of No. 1A winder. It was anticipated that this work would be completed shortly, after which the commissioning of No. 1B winder would commence.

Conclusion

The operations which have been described had to be carefully planned and continual consultation had to be effected between all parties concerned, mainly the NCB officials, Mines Inspectorate, and the various contractors and their technicians. Many minor changes in plan had to be made quickly in order to overcome various small difficulties. The contents of the paper describe only a small part of a large and extensive project.

The author wishes to thank the NCB staff and contractors' technicians who assisted in the compilation of this paper, and Mr. R. D. Glass, Area general manager, West Ayr Area, Scottish Divisional Coal Board, for his permission and encouragement to present this paper. Views expressed are the author's and not necessarily those of the NCB.

DISCUSSION

MR. R. TUCKER wondered if there had been any difficulties with slip, and he asked what methods had been used to overcome them, what method was used to groove the rope drums, and the capacity of the winders for dealing with dirt in the downcast shaft. He asked if the author considered the capacity of the winder adequate for the amount of dirt. At collieries where a gallery-type fan drift was in operation there had been considerable difficulties with condensation effects. In view of this, was regard paid to experiences at other collieries in this matter? he asked. Mr. Tucker also asked what arrangements had been made for dealing with coal spillage from the skips at the pit bottom.

Replying, the AUTHOR said they had not yet been troubled with slip, but they could not expect to be always so fortunate. Slip was to be expected, but if the ropes and the shafts were kept fairly dry, and attention paid to grooves on the winding drums, slip could be controlled. Cutting the grooves in the first instance was carried out by a specialist firm by means of a post-mounted cutting tool installed on the winder floor, each groove being checked with a micrometer to within a few thousandths of an inch. The capacity of the downcast shaft at the moment was between 120 and 150 ton/hr.

The fan drift was perhaps of unusual design, and the author understood there were only two others in the country of similar design. Serious consideration was given to all experiences, and they were confident the design would suit the needs of the colliery. There were two fans, each of 600,000 cub. ft. capacity. The arrangements for dealing with coal spillage had not yet been finalized, and would depend on the arrangements for preventing spillage. A drift from the 770-yd. level to the bottom of the sump, to deal with any spillage which took place, would be driven.

MR. R. F. YOUNG asked for more detail about the ventilation. He understood that two booster fans were used and asked where these were sited. Mr. Young also asked if exemption from the Mines Inspectorate was obtained, whether there was any difficulty with leakage, and whether any special precautions were taken to deal with the possibility of power failure.

In reply, the AUTHOR said there was 100,000 cub. ft./min. of natural ventilation with winter temperatures at Killoch Colliery which tended to reverse during the summer. The main surface fan was not completed and there were three ventilation levels. The 805-yd. level was ventilated by natural ventilation, at the 570-yd. a

booster fan delivered 40,000 cub. ft./min., and at the 630-yd. one delivered 20,000 cub. ft./min. These arrangements were agreed with the Inspectorate and would continue until the main surface fan took over. Winter temperatures were now being experienced and they would have sufficient natural ventilation during power cuts.

MR. G. GILLESPIE emphasized that detailed consultation was necessary at all stages, with frequent consultation between board officials and the Mines Inspectorate and board officials and the contractors. The safety factor had to be given priority. With regard to slip, one of the factors which required careful attention was the tension on the ropes, and daily tests were applied. If a small fraction of dirt was allowed to build up in any groove, there was an immediate reaction on the tension, and therefore each rope was examined daily.

MR. J. W. PIRIE asked for the author's views on the shaft-top doors. He also asked if they were found to be of advantage during skip and counterweight rope installation. He was interested in the measures taken after the ropes were installed to ensure they were equalized, using the GHH dynamometer at Killoch, as distinct from load cells used in other installations.

Mr. Pirie commented that experience had shown that rope equalization was obtained if the grooves were adjusted in accordance with requirements and provided they were made of the same timber initially, and there was not too much moisture present in the shaft which caused the elm wood treads to become spongy. He asked to what extent the plans made by officials at area and colliery level were discussed with the personnel responsible for carrying out the job.

The AUTHOR replied that the shaft-top doors helped a great deal during the installation of the skip. The skip-changing trolley was easily run across the shaft top doors. If a rope was found that was not taking its share of the load, a fine adjustment on the attachment gear was used or the groove was cleaned. GHH readings were taken carefully every day. A weekly meeting was held every Thursday, and all concerned attended to discuss the following week's programme. Everything was gone into very fully and work further ahead was also examined and priorities reassessed. There must be full discussion with everyone responsible for a particular job to get the work carried out properly.

SIR ANDREW BRYAN, commenting that obviously a great deal of planning had gone into the work of fitting these shafts, asked if the author had to do it over again, were there any items he would change.

Replying, the AUTHOR said a great deal of experience was gained on the job and the installation could be improved. The pattern would not be changed on a similar installation, but he was sure they could improve on the time in finalizing details and possibly shorten the job.

In reply to MR. H. H. WILSON, the AUTHOR said that the fact that there were two winders in one shaft and 24 ropes was evidence that the arrangement was complex compared with the conventional system. It was difficult to draw a comparison between the two types.

Two ropes, he said, had been changed in the No. 2 shaft. One was changed in 36 hr. and the second one in 30 hr.

LAND RECLAMATION AFTER MINING OPERATIONS

DERELICT land in England and Wales totalled about 160,000 acres, Prof. S. H. Beaver told mining surveyors at a meeting of the Royal Institution of Chartered Surveyors at Hanley (Staffs) on April 9.

Great strides had been made in the field of planning legislation and procedure, as well as in the mechanical and scientific techniques of reclamation, and there was no doubt that an entirely different climate of public opinion now existed from that which characterized the immediate post-war years, said Prof. Beaver.

In 1945, some 9,300 acres of derelict land existed in the Black Country, much of it the result of 19th century coal and ironstone mining. By 1954, only 5,800 acres remained derelict, the rest having been reclaimed, largely by the local authorities.

For every 100 tons of coal produced in Great Britain, between 13 and 30 tons of spoil went on to the spoilheap. There were several possible methods of reclaiming the land; for example, tree planting on conical or ridge tips, without altering the shape of the heap; reshaping the heaps and grassing them over; reshaping to produce an extensive flat top on which playing fields could be created; removing the heap and depositing its material into neighbouring quarries or areas of low-lying or subsided ground.

In general, restoration to agriculture was uneconomic except in the case of shallow, dry, gravel pits.

Restoration costs of between £500 and £2,300 per acre for open-cast coal mines had to be balanced against agricultural productivity, lower than that of normal farmland, valued at only £25 per acre gross or about £7 per acre net.

Forestry could be economic if no levelling costs had to be borne and provided that large enough areas were treated without grants or subsidies; but afforestation in place of formerly high-quality grassland did not meet with general public approval, particularly if much of the plantation was of coniferous species.

The treatment of colliery spoilheaps was also, in general, hopelessly uneconomic, for costs of levelling or regrading might be anything from £6,000 to £12,000 per acre, and the agricultural returns negligible by comparison. In all these cases it was the amenity value of the operation which was of paramount importance.

"Whether it is economic or not, in the short run or in the long run our descendants will surely approve of our now almost universal policy of clearing up passed dereliction and avoiding the creation of more derelict acres. There are some things that cannot be easily measured in terms of money, and the amenity of our landscape is one of these," said Prof. Beaver.

Industrial and Domestic Gas Supplies

RECENT TRENDS AND DEVELOPMENTS

Last of the three Cantor Lectures given under the general heading of "The Fuel and Power Industries and National Prosperity," entitled "Natural and Manufactured Gas," was delivered by Dr. Albert Parker, lately director of fuel research, Department of Scientific and Industrial Research, before a meeting of the Royal Society of Arts in London. The author dealt with natural gas, the coke-oven industry, the gas industry, and with the various by-products arising, the last item being only briefly referred to in the appended extracts.

Natural Gas

DURING the last few decades, there has been considerable development in many countries, particularly in America, Europe, and the USSR, in the treatment and distribution of natural gas to meet industrial and domestic needs. In most instances, the gas has to be conveyed under pressure through long pipe lines to the areas of use. In such circumstances, most of the higher hydrocarbons are removed, being recovered partly as light oil or gasoline and partly as low-pressure gas.

In many instances, crude natural gas contains hydrogen sulphide and carbon dioxide in amounts that vary considerably with the source of the gas. The hydrogen sulphide must be removed before the gas is distributed for public supply. A few years ago, there was a world shortage of sulphur, which is used mainly for the manufacture of sulphuric acid. Today, largely owing to the additional supplies of sulphur obtained from the hydrogen sulphide removed in the purification of natural gas and in the treatment of petroleum refinery gas, there are ample supplies of sulphur to meet world demand; and there are plans to extend the use of natural gas, including the recovery of sulphur from crude gas containing hydrogen sulphide.

One example of gas of this type with which the author has been concerned is a volume of about 80,000,000 cub. ft./day of a mixture of petroleum well gases and refinery gases at Kirkuk in Iraq. This mixture, which has so far been wasted, contains on average about 44 per cent. of methane, 44 per cent. of higher hydrocarbons, 10 per cent. of hydrogen sulphide, and 2 per cent. of carbon dioxide. Under a scheme of treatment planned this gas could provide per day about 60,000,000 cub. ft. for general distribution, and 300 tons of sulphur. Another example is the natural gas discovered in recent years near the village of Lacq in south-west France at a depth of about 12,000 ft. below the surface and a pressure of nearly 1,000 lb./sq. in. In 1958, the production of purified gas from the deposits at Lacq was 13,850,000,000 cub. ft., or about 150,000,000 therms, 127,000 tons of sulphur, 21,000 tons of petrol, and 8,600 tons of propane and butane. The plant has since been greatly enlarged, and when further planned extensions have been completed in 1961 the annual production should be about 150,000,000,000 cub. ft. of gas, of a calorific value of 1,100 B.Th.U./cub. ft., or 1,650,000,000 therms, 1,300.000 tons of sulphur, 250,000 tons of petrol, and 113,000 tons of propane and butane. It is interesting to note that the calorific value of the gas at 1,100 B.Th.U./cub. ft. is somewhat more than twice that of the gas supply in this country, and that a production of 1,650,000,000 therms per annum is about three fifths of the whole of the gas sold by the British gas industry.

Coke-oven Industry

In the early days of the use of coke for pig-iron production, no measures were adopted to collect and recover the by-products gas, tar, and ammonia evolved during the carbonization of the coal. By-product coke ovens designed to collect and recover the by-products were first introduced about 90 years ago, but ironmasters were slow in adapting the new methods of making the coke; and even by the year 1900 only 7 per cent. of the metallurgical coke produced in this country was made in by-product ovens. Progress then became more rapid and by 1928 by-product ovens produced 94 per cent. of the metallurgical coke made in the UK.

The amount of this grade of coke required, and thus the amount of coal carbonized in coke ovens, is dependent mainly on the demand for iron and steel, which, in turn, is dependent on overall industrial activity. In consequence, there have been fluctuations from year to year in the future, it is metallurgical coke made in this country, but with a general trend upwards over the last few decades as the iron and steel industry has expanded. The maximum so far was reached in 1957 when the industry carbonized 30,800,000 tons of coal to produce 20,500,000 tons of coke and 1,400,000 tons of breeze. With the trade recession in 1958, the amount of coal carbonized in coke ovens fell to 27,900,000 tons. Though there will no doubt be fluctuations from year to year in the future, it is probable that on average the iron and steel industry of this country will continue to expand over the next 10 to 20 years and that the demand for metallurgical coke will increase, even allowing for further increase in the efficiency of using coke in the metallurgical industries.

The quantities of coal carbonized, coke, gas, and

by-products made in 1958 (1948 figures in parentheses) were as follow:—Coal carbonized (million tons), 27.9 (22.3); coke made (million tons), 18.5 (15.4); coke breeze made (million tons), 1.2 (0.9); gas made: (*a*) thousand million cub. ft., 310 (243), (*b*) used in coke-oven plants, 118 (117), (*c*) used in steelworks, 85 (49), (*d*) sold to the gas industry, 92 (60). By-products made: (*a*) crude tar (thousand tons), 1,079 (860), (*b*) sulphate of ammonia (thousand tons), 245 (180), (*c*) crude benzole (million gals.), 84 (65).

The gas industry now employs several methods of gas manufacture. These include the carbonization of coal to produce coal gas, the interaction of coke at a high temperature with steam to produce water gas (hydrogen and carbon monoxide), which may be enriched with the products of "cracking" petroleum oils, the interaction of coke with air and water vapour to provide producer gas, the gasification of petroleum oils, and several systems of complete gasification of coal.

At the present time, about 80 per cent. of the gas made at the gasworks in this country is coal gas, 17 per cent. is water gas, including water gas enriched with petroleum oil, leaving only 3 per cent. made by all the other processes. The gas made for the base-load demand is almost entirely coal gas; the water gas is used mainly to increase the supply to meet the peak loads. More than 60 per cent. of the coal gas is made in continuous vertical retorts. Of the gas available to industry, about 82 per cent. is made at the gasworks, 16 per cent. is bought from the coke-oven industry, and 2 per cent. includes gas bought from petroleum refineries and from the coal industry.

China's Mineral Self-sufficiency

COMMUNIST China appears to be more than self-sufficient in most minerals, both for the present and for the future, states K. P. Wang, Far East specialist of the division of foreign activities of the US Bureau of Mines, in a report presented to the American Institute of Mining, Metallurgical, and Petroleum Engineers' annual meeting in New York.

However, he says, some items are scarce. The coal and iron-ore base is very strong; coal, including coking coal, has long been considered adequate and iron-ore reserves are much more extensive than formerly estimated. Petroleum is inadequate, but extensive exploration in recent years shows that the country will be prominent in this field five to 10 years from now. The ferro-alloy minerals needed to support steel production—manganese, tungsten, and molybdenum—are abundant, whereas chromium and nickel have not shown much promise. Copper, lead, and zinc reserves seem to be large enough for medium-scale operations. A great shortage of copper exists, however, and Communist China's thinking is directed towards substitution by aluminium to the extent feasible. The future possibilities for making aluminium and magnesium are fairly good.

Chinese antimony, tin, bismuth, and mercury are first rank, both in reserves and production. With regard to minerals for making chemicals and fertilizers, the salt supply is excellent, sulphur is moderate, and phosphate ore, while extensive, is not yet extracted in sufficient quantity to meet requirements.

Hungarian Steel Combine Completing First Phase

PREPARATIONS are under way for the tenth anniversary celebrations of Sztalinvaros, the youthful Hungarian steel town, which lies on the Danube about 40 miles south of Budapest. The steelworks there has so far cost the country about 6,700,000,000 forints (about £200,000,000 at the regular exchange rate) and the town itself 1,500,000,000 forints. The first phase of the project is now approaching completion and by the second half of this year the vertically integrated steel combine will become self-supporting as regards production costs and amortization of existing plant, with the State providing for further investments.

The works comprises a coal-washing plant, a coke-oven plant, two blast furnaces, three open-hearth furnaces (with a fourth under construction). Hot rolling mill plant of about 500,000 tons annual capacity is at present being built and a cold rolling mill will be ready by 1963. There is also a chemical works for coal derivatives.

The first phase ends in 1963 and by then the combine will have a capacity of 500,000 metric tons of rolled steel a year. The capacity will increase to 1,000,000 tons by 1975, the end of the second phase. Its present annual capacity is 600,000 tons of pig-iron and 350,000 tons of crude steel.

Hungary has no deposits of iron ore and supplies come from Krivoi Rog in the Soviet Union. Most of the coal comes from Komlo and Pec in Hungary, and the rest, about 18 per cent., from abroad, chiefly Poland. The combine was the first to coke Hungarian coal, and the managing director, Mr. Ambus Borovszki, claims that the coke has proved to be of very high quality.

New figures issued by the Hungarian Government show that hopes for the country's steel industry overall have not been realized. It was expected that Hungary would be producing 4,000,000 tons five years ago, but the recently-published target for 1965 is only 2,400,000 tons. Last year's output was 1,760,000 tons, against 1,630,000 tons in 1958, but some production figures given contradict earlier statistics.

For instance, production in 1957 is now said to be worth 1,100,000,000 forints, compared with a previous figure for the year of 400,000,000 forints, and production this year is given as 2,300,000,000 forints, compared with a former estimate of 1,200,000,000 forints. Hungarian productivity levels in the steel industry are said to be under one half the average Russian levels.

Standards in History

A one-day conference of engineers and others concerned with the application of standards in industry is to be held on May 11 at the Connaught Rooms, Great Queen Street, London, W.C.2. It is organized by the British Standards Institution jointly with the Institution of Production Engineers.

Pilot Plant for Synthetic Liquid Fuel

A pilot plant for the production of synthetic liquid fuel from coal, believed to be the first of its kind in India, has been set up in the Indian Institute of Technology at Kharagpur. Designed and constructed by the staff of the institute's Department of Chemical Engineering, the plant has a daily output of 100 gallons of synthetic oil. It operates the Fischer-Tropsch process, which has been installed to obtain engineering data on the design, construction, maintenance, and operation of various pilot plant units.

Fuel Efficiency Exhibition

DEVELOPMENTS in fuel efficiency dictated by overall industrial technological progress and encouraged by the Clean Air Act are shown at the Fuel Efficiency and Power for Industry Exhibition, which opened at Olympia, London, on Wednesday and continues until May 6.

The efficient use of coal in modern industrial equipment is demonstrated at the National Coal Board's stand, where four types of modern coal-firing equipment are exhibited:—A chain grate stoker and ash extractor together with automatic control equipment; a coking stoker, also automatically controlled; an underfeed stoker, and a gravity feed boiler.

Animated displays illustrate the De Poray boiler system, the board's technical and sales service, coal preparation, and the new housewarming plan.

The British Iron and Steel Federation display shows major aspects of a fuel efficiency and clean air programme carried out by the steel industry as part of its £1,000,000,000 development programme which will be completed by 1962. It has resulted in greatly improved amenities and a marked conservation of fuel.

A fully-working heat-treatment shop forms the Gas Council's exhibit. Working equipment includes a bright-annealing furnace, a high-temperature oven, a tempering oven, hardening and tempering salt baths (ICI), a flame machine for hardening spindles, water and oil quench tanks, and a hardness-testing machine.

Industrial Equipment

Individual manufacturers show a wide range of equipment. One automatic coal stoking machine demonstrates an entirely new modulating control system which ensures that any fluctuation in the boiler load is catered for by graduating the coal and air supply automatically. This arrangement, coupled with controlled secondary air, makes the machine ideally suited to burning bituminous solid fuel in smoke-controlled areas.

A horizontal boiler of entirely new design, suitable for firing either with oil or with solid fuel, claims an efficiency of over 80 per cent.

A coal-fired packaged boiler for installation as a complete unit is displayed. Current market trends, for many reasons, have become increasingly in favour of this type of construction, which up to now has been regarded as having particular application to oil-fired units. Previously, coal-fired boilers have been confined to the standard orthodox design of equipment, but in view of the importance of utilizing fully the nation's natural fuel resources it is logical that the proven simplicity of measures inherent in packaging should be applied to coal-burning installations.

An impressive exhibit is a three-roller Lupulco mill for a power station. This mill, over 21 ft. high and weighing 76 tons, is exhibited for the first time and illustrates the significant advance in mill design to provide an output of 25 tons of coal per hour from a single mill.

A unique design of a simple vertical boiler, claimed to represent the greatest advance for many years in this class, offers many advantages, among them high performance in fluctuating loads, maximum safety, and low maintenance costs. Between the primary and secondary combustion chambers the inner lining of the boiler shell is necked to provide a throat through which all the combustion products must pass so as to promote mixing and complete combustion.

A model of a new electrostatic precipitator designed especially for the iron and steel industry is shown. Other precipitators, for the cleaning of boiler flue gases to a high degree of efficiency, are exhibited.

A series of technical meetings arranged by a committee convened by the Institute of Fuel will be held in the Conference Hall at Olympia on May 2 and 3, under the general title "The Selection of Fuel-using Equipment and Power Plant."

NACM Conference

Attractions for the Ladies

CHOICE of Southport for this year's annual conference of the National Association of Colliery Managers is an especially happy one for the ladies, and it is not surprising that many members have intimated that they will be accompanied by their wives. A spacious and well-planned town, Southport is much more than an attractive seaside resort. Fine shops, fashion salons, and cafés are to be found in the town, especially in and around Lord Street, while the tree-lined boulevards, promenades, and gardens rival those of any resort.

The extensive programme arranged for them will allow the ladies to enjoy the amenities of the town to the full and also to visit many interesting places in the vicinity. On the first day, for example, there is a full-day coach tour. Morning coffee at Haigh Hall, Wigan, will be at the invitation of the Lancashire branch of the NACM, and the ladies will be the guests of Gullick, Limited, for luncheon at Rowton Hall, near Chester. After spending some time in the ancient city of Chester, the party will return to Southport by way of the Wirral peninsula and the Mersey Tunnel.

There is a choice of tours for the second day. Those who visit the Ribble and Hodder Valleys will be entertained at luncheon by the Mastabar Mining Equipment Company, Limited, at Stirk House, Gisburn, and that company will also entertain the ladies making the alternative choice at luncheon at Blundellsands. This party will visit the biscuit factory of W. & R. Jacob & Company (Liverpool), Limited, the factory of Schweppes, Limited, or the colour printing works of Eric Bemrose, Limited, tea being taken at the factories.

On the last day of the conference the ladies will be the guests of Oldham & Son, Limited, at luncheon.

In addition to this programme, the ladies will also join the members at various other social events. Copies of the full conference programme may be obtained from the offices of the National Association of Colliery Managers, 17-19 John Adam Street, Adelphi, London, W.C.2.

Report on Bickershaw Pit Explosion

FIVE men were killed when an explosion occurred behind stoppings in the Plodder Seam at Bickershaw Colliery, Leigh (Lancs), on October 10, 1959.

The explosion occurred on the No. 9 face, and in his report on the causes of the explosion and the circumstances attending it, Mr. R. H. Clough, HM Divisional Inspector of Mines and Quarries, concludes that it was mainly one of firedamp which collected on the No. 9 face and in the main and top levels when the stopping on these latter two roads were finally plugged and sealed. He believes the firedamp was ignited by heated material lying possibly within packing of No. 8 face, which had been sealed off earlier.

He thinks that the danger of explosion following sealing was accentuated by the rapid fall of barometric pressure experienced before and during sealing. It is possible that coal dust played some part in propagating the explosion towards the main level stopping.

Divisional Inspector's Appreciation

Mr. Clough places on record his appreciation of the exemplary behaviour of all persons in the neighbourhood of the stopping when the explosion occurred.

Everyone seems to have acted with immediate concern for the safety of the five men, and in particular, the act of putting the roadway conveyor into its normal running direction was a resourceful move made in the hope that some survivor would not be too disabled to use this means of getting to safety. That it was unavailing does not detract from the inspiration which prompted it, he states.

In the course of his recommendations, Mr. Clough says he understands that the council of the Institution of Mining Engineers has appointed a small committee to revise the memorandum, "Sealing Off Fires Underground," originally published in 1944. Although the point may not strictly be within the terms of reference of this committee, he thinks it should consider, concurrently with other related matters, the value to be attached to the relationship between carbon monoxide produced and oxygen absorbed, and, indeed, any other relationship between constituent gases, found in samples of atmosphere taken from behind stoppings as indications of continuing fire or of the progess of spontaneous combustion.

Where, with longwall working in seams liable to spontaneous combustion, it is the practice for successively worked faces to strip the goaf edges of previous workings already stopped off, further measures should be considered with a view to minimizing leakage between a working area and a sealed one, the inspector states. In this connection, the already common practice of burying packs should be extended. In addition, sand packing should be inserted alongside coal ribs, especially where these will be subsequently taken out by a succeeding working.

In all cases, the time which elapses between a working face ceasing production and its final isolation with explosion proof stoppings should be as short as possible compatible with the recovery of valuable machinery and materials.

Need for Rapid Completion of Stoppings

Since the danger of an inflammable atmosphere can arise in any area or workings to be sealed as soon as the ventilation is reduced in amount by the beginning of the stoppings, their completion to an explosion proof condition should be effected as quickly as possible, whether fire is present or not.

Consequently, in seams liable to spontaneous combustion the Divisional Inspector recommends that sites for stoppings should be selected and some preparatory work done while the unit is still in production. In fact, in some seams where spontaneous heating is frequent, such preparatory work has been traditional practice.

Coal-chemical Output Falling Short of Demand

CHEMICAL raw materials from by-product-coke ovens will have to be supplemented with petrochemicals to meet growing world requirements, according to Joseph A. DeCarlo, Harry Perry, and Eugene T. Sheridan, of the bituminous coal division of the US Bureau of Mines, in "Coal Chemicals for World Markets" (information circular No. 7948).

The report tabulates production and consumption of crude tar, light oil, ammonia, and their principal derivatives for the United States and 16 other nations. It shows that international demand for these chemicals is outstripping the capacity of the coke industry, which obtains them as incident products in carbonizing bituminous coal at high temperatures to make blast-furnace fuel.

Despite improvements in blast-furnace technology, which tend to reduce coke requirements, expanding steel output will increase overall coke consumption and thus add to the supply of by-product chemicals, the report says.

However, rapid growth in industries making plastics, drugs, fertilizers, synthetic fibres, and other items is creating markets that cannot be satisfied by coal chemicals alone.

Although chemicals obtained in processing petroleum and natural gas will be needed to augment those from coal in the immediate future, the bureau believes that coal ultimately may regain its position as principal supplier of chemical raw materials. As prices of petroleum and natural gas rise, the report says, methods for extracting coal chemicals by low-temperature carbonization, hydrogenation, and gasification should become economic and thus provide new supplies.

The US leads the world in coal-chemicals output, the USSR being a close second. The United Kingdom, West Germany, France, Japan, and Poland are also important producers.

ELECTRIC-ARC STEELMAKING FURNACE ROOFS

Thicknesses Variation to Counter Temperature Gradients

Linings of electric-arc furnaces operate under high concentrations of dust and with varying gas composition during melting, particularly when blown with oxygen. In the roof, temperature conditions are abnormal and unequal expansion causes spalling of refractories. To overcome this defect at the Chelyabinsk iron and steel works the furnace roof centres are graded in thickness and composition to take care of the severe temperature gradients. The work is described by M. N. Kaïbicheva, N. A. Tulin, and N. I. Fadeeva, all of whom are associated with the Eastern Refractories Institute. The article was published in Metallurg, No. 12, 1959.

LININGS of electric-arc furnaces work under conditions of a high concentration of dust during melting, changing gas composition, and high temperatures which vary widely within the furnace chamber. As a result of recent investigations it has been established that the concentration of dust within the space below the roof of an electric furnace varies from 0.75 to 50.5 g/cub. m, (0.432 to 22.0 gr./per cub. ft.), dependent upon the point in the melting period, attaining a maximum when the bath is blown with oxygen.

The dust consists of 74 per cent. iron oxides and a large quantity of manganese and magnesium oxides. Such a composition is marked by its low refractoriness (1,480 to 1,560 deg. C.), which is lowered by from 250 to 270 deg. C. in a reducing atmosphere. The dust permeates the refractories, leading to physical, and chemical heterogeneity of the individual zones of the lining, and also to a reduction in the refractoriness of the working zones.

The development of conditions during melting to give minimum liberation of dust and a gas of constant composition, preferably oxidizing, would considerably prolong the working lining life of electric-arc furnaces.

Operational temperature conditions for electric-arc-furnace linings vary severely. Thus, in the centre of the roof, at a distance of 50 mm. from its hot surface, temperatures vary by as much as 300 to 600 deg. C., while the rate of temperature change may reach 150 deg. C./min. Around the periphery of the roof the fluctuations in temperature are considerably less.

The difference in the temperature gradient through the thickness of the central and peripheral sections of the roof leads to differing rates of wear. The central part wears out from two to four times more quickly than the periphery. Wear usually takes the form of spalling. In the furnaces at the Chelyabinsk works spalls of two types are observed—5 to 15 and 30 to 80 mm. thick. The first of these occur along cracks located close to the working surface of the brick, while the second is found along a crack formed at the boundary between the dense and the porous zones. Wear on the central part of the roof takes place for the most part on account of the larger areas of spalling. A reduction in this objectionable process, and consequently of the wear on the central part of the roof also, is possible by reducing the temperature gradient in that particular section. The latter may be achieved by an increase in the thickness of the central section of the roof, this portion suffering the greatest wear.

On this basis a design of roof of varying thickness was developed and tested in service in an electric-arc furnace (Fig. 1). The thickness of the peripheral part of the roof was that normally used, namely, 230 mm., while that of the central part was 300 mm. The diameter of the section of the

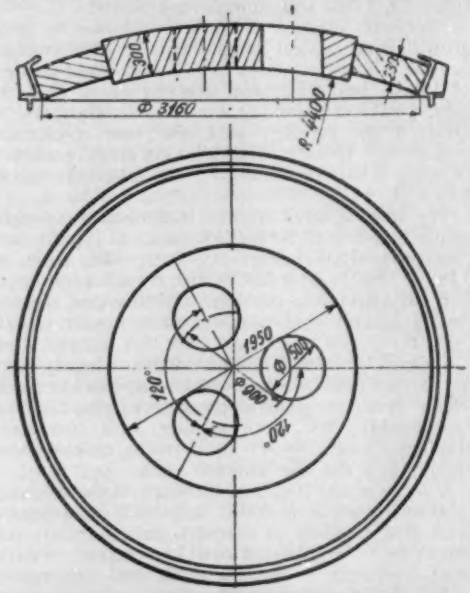


FIG. 1.—ROOF DESIGN OF VARYING THICKNESSES FOR AN ELECTRIC-ARC FURNACE.

increased thickness was 1,950 mm., while the overall diameter of the furnace was 3,160 mm. The lining of the roof was annular, and it was laid according to the normal pattern, the peripheral section being bedded in sand. There are three possible ways of placing the lining in a roof of varying thickness:—(1) so that the section of increased thickness projects upwards only; (2) so that this section projects equally both upwards and downwards, or (3) so that it projects downwards only into the working chamber of the furnace.

If the lining is laid in accordance with either (1) or (3), the transition from the section of the roof of normal to that of increased thickness must take place gradually. This is achieved by the use of wedge-shaped bricks of the same length as the section of the roof of increased thickness. At the Chelyabinsk works the roofs are, in fact, lined in accordance with the second method. In the furnaces with roofs of different thicknesses the following steels have been melted:—Carbon; structural; ball-bearing; free-cutting; tool; heat resisting; chrome-tungsten, and other steels.

Use of the roofs of varying thicknesses in electric-arc furnaces at this plant has made it possible to extend their working life from around 100 up to between 160 and 185 melts. At the present time roofs of furnaces, in which the 300-mm. thick bricks were used, are lined with bricks of varying thickness. But results so far attained are limited by the fact that at the time of writing, the roof was not fully utilized due to the rupture and temporary absence of the waste-heat ultilizers which were being refitted.

Use of a roof of varying thickness with a rational type of lining having reinforced electrode apertures with a concrete shield for waste-heat utilizers makes it possible to cut out intermediate refits connected with replacement of the central section of the roof. This reduces labour costs besides the consumption of materials for the refit, and extends substantially the working life of the roof.

Niobium Additions to Killed Steel

EFFECTS of niobium on killed heat-treatment steels have been recently studied by a research group at Battelle Memorial Institute, Columbus, Ohio, the work having been sponsored by the Kennecott Copper Corporation, New York. The principal results have been presented by E. E. Fletcher and A. R. Elsea, both connected with the institute, in an article published in Iron Age (February 25, 1960) and summarized below.

Niobium imparts a strong resistance to grain growth, even in steel killed with 2 lb. of aluminium per ton. Small amounts increase the yield strength of killed, heat-treatment steel by more than 3.5 tons. Of four niobium contents studied, one of about ½ lb. per ton gave the best mechanical properties. If extra resistance to grain growth is required it may be obtained by an addition of from 8 to 9 lb.

The steel selected for the study was a wrought, aluminium-killed, SAE 1035 steel, a typical percentage analysis being:—C, 0.33; Mn, 0.67; Si, 0.19; P, 0.027; S, 0.028, killed by an addition of 2 lb. of aluminium per ton. To this steel the following additions of niobium were made:—0.012, 0.09, 0.17, and 0.35 per cent. A control heat containing none was also available. Ingots from the various heats were forged into square bar stock, which revealed pearlite patches varying in size considerably, but were smaller with increasing niobium content. All four steels showed finer grains than did the control steel.

A study of the effects of niobium on the response to heat-treatment included influence on austenite grain size, solution of carbides, hardenability, and tempering. An addition of 0.35 per cent. imparts great resistance to grain growth, and this results in fine grain size even when steel is austenitized at 1,100 deg. C. Although smaller niobium additions are less effective in retarding grain growth of SAE 1035, even 0.012 per cent. raises the grain-coarsening temperature by about 40 deg. C.

The niobium carbide present was very hard to dissolve, and only in the steel with the lowest content were the carbides in solution after a treatment of 1 hr. at about 1,000 deg. C. In the three steels of higher content much of the carbide remained undissolved after 1 hr. at about 1,250 deg. C. Fewer carbides are present after treatment at the higher temperatures, than in the as-normalized material, although the average particle size was considerably larger. For austenitizing temperatures below the grain-coarsening temperature increasing the niobium content appreciably reduces hardenability. At higher austenitizing temperatures, as would be expected, hardenability increases with increasing grain size.

The four niobium steels resisted softening when tempered from about 500 to 525 deg. C., and, when tempered in this range, all four were harder by about 3 Rc than the control steel. A study of various tempering times at the higher temperatures indicated that secondary hardening is unimportant.

An addition of 0.012 per cent. niobium raised the yield strength of the normalized steel by 3,400 lb./sq. in. and of material quenched and tempered at various temperatures by 4,100 to 8,200 lb./sq. in.

The effect on tensile strength is slightly less, but it is achieved without loss in elongation or reduction in area. In nearly all instances, strengths of steels with 0.09 per cent. or more niobium were lower than that obtained with the small addition of 0.012 per cent. Comparison of material water-quenched after tempering at around 620 deg. C. with material furnace-cooled after tempering showed that the steels with 0.09 per cent. or less niobium had a small degree of temper brittleness.

Metallurgical Progress

Some abstracts from recent reports on research and development, at home and abroad

Ironmaking in India. G. R. BASHFORTH. (Blast Furnace and Steel Plant. 1960. Vol. 48; No. 2; pp. 189-193). The author outlines the deposits and qualities of iron ores, manganese ores, and fluxes, and the reserves of coking coal in India. The blast furnaces erected recently follow conventional lines, the capacity varying from 1,000 to 1,500 tons per day. Hearth diameters range from 23 ft. 8 in. to 28 ft., while the ratio of bosh to hearth diameter varies between 1.10 and 1.13, the bosh height being 10.5 to 14.4 per cent. of the total height. The useful volume per ton of daily output, with the exception of the older furnaces of the Indian Iron & Steel Company, Limited, varies from 30.9 to 35.4 cub. ft. Firebrick linings are generally employed, although a carbon hearth has been installed at Rourkela, and at Durgapur the sidewalls and hearth are constructed of carbon blocks. All the furnaces have been designed for high top-pressure operation.

Indian blast-furnace practice is based on the use of rich iron ores, generally possessing an unfavourable alumina/silica ratio, and a very high ash coke. Under normal conditions it requires 1.65 to 1.70 tons of iron ore, 0.85 to 0.95 ton of coke, and 0.3 to 0.4 ton of limestone to produce 1 ton of pig-iron. The slag volume is usually low, but the high alumina content of the slag, from 28 to 30 per cent., introduces difficulties. Some plants incorporate either quartzite or a lean, siliceous iron ore in the burden in order to reduce this alumina content of the slag. Recently sinter plants have been installed by the Tata Iron & Steel Company, Limited, and other concerns.

Diamond Abrasives. ANON. (Steel. 1960. Vol. 146; No. 6; pp. 80-1). The use of carefully sized diamond powder produces metallographic specimens which combine superior flatness with the retention of inclusions and preservation of the original form of the metal structure. One advantage of the method is that it can be applied to hard or soft samples without changing the basic procedure. Samples are prepared by mounting them in a plastic and firstly they are rough polished. While polishing, the specimens are turned 90 deg. after each step, so that scratches from the preceding stage can be seen. The intermediate polish employs a spiral cut, the wax wheel rotating at 360 r.p.m. and using a 600-grit, paste-type, silicon-carbide abrasive.

The next stage is diamond polishing, carried out in two steps. A low-nap Gamal cloth is used on standard 8-in. wheels, rotating at 600 r.p.m. The coarser diamond paste is 5 to 8μ, the finer being 0 to 1μ dia. Paste is charged at the centre of the cloth. A final polish removes the superficial scratches resulting from the diamond polishing. An 8-in. wheel, with a low-nap Gamal cloth, rotating at 600 r.p.m. is used. For ferrous materials levigated alumina is used as the abrasive. The time for preparation of samples by this method does not exceed 30 min.

French Converter Process. ANON. (Steel. 1960. Vol. 146; No. 5; pp. 92-4.) The process at the Société Usinor's Denain plant converts pig-iron in a stationary vessel. Powdered lime is blown on the surface of the melt by a jet of pure oxygen. The vessel is a modified basic-bessemer converter, the bottom with tuyeres, being replaced by a solid one. Lined with a tarred dolomite material, the vessel is 8.5 ft. dia. at the bath level. A copper-tipped lance, cooled with about 8,000 galls. of water per hour, is placed vertically over the bath. It can be adjusted laterally or vertically, for removal from the converter, or adjustment of the distance between nozzle and bath. A lime dispenser accurately and uniformly injects an amount of powdered lime into the oxygen stream.

The concentration depends on pig-iron composition, refining phase, and the desired steel analysis. Iron reaches the converter from ladles or from a mixer. The lime may be ground by rotary crushers at the steel plant to pass 2-mm. screens, or be delivered as a screened product in air-tight containers. The oxygen used is 99.5 per cent. pure; it is available at 210 lb./sq. in., and metered into the vessel at 85 lb./sq. in. The oxygen flow into the converter is limited to 3.5 cub. ft./min. The conversion time is 1 hr. for a 30-ton heat at Denain, but this may be cut to 45 min. when the oxygen generating plant is enlarged.

High-phosphorus iron can be converted by blowing with lime powder and oxygen throughout the refining operation. Removal of high lime-low iron slag once or twice during the operation takes out much of the sulphur and phosphorus. Before the blow, the converter receives cooling additions, but no flux. The lance is lowered and about 1,760 cub. ft. of oxygen and 240 lb. of lime are injected per ton of iron. When the slag is drawn off, the metal has a temperature of 1,590 deg. C.; it contains about 0.6 per cent. carbon and 0.1 per cent. phosphorus. After slag removal, the addition of scrap and ore cools the bath, and blowing is continued until the desired carbon content is obtained. The final phosphorus content is <0.02 per cent.

Measuring the Heat of Moving Strip. ANON. (Iron Age. 1960. Vol. 186; No. 3; p. 96.) Radiation thermometers measure surface temperature of steel strip moving at 2,000 ft./min. through a tinplate annealing furnace. Thermal rays, emitted by the strip, vary as a function of the strip's temperature. An optical mirror focuses these rays on to a sensitive infra-red detector, which generates a voltage signal. After amplification, the signal

is fed to a meter or oscilloscope, where conversion to temperature readings takes place. Operation is remote and the unit scans a linear field to obtain a temperature profile of the moving steel strip. Rapidly varying temperatures can be monitored visually or can be permanently recorded. The optical head sights on the moving steel strip from distance, 4 ft. or greater. A telescopic sight provides a view of about 0.5 deg. This enlarges the picture presented to the infra-red sensing detector.

At any working distance, the field of view resolves a spot size which varies directly with the distance. For accurate temperature measurements the spot size must be smaller than the work. For an object with a "sighted" dimension of 3 in., the optical head may be located up to 30 ft. away. The instrument can check temperatures of moving and/ or inaccessible surfaces from room temperature up to 4,425 deg. C.

Powder Metallurgy. J. R. VAN ORSDEL. (Journal of Metals. 1960. Vol. 12; No. 1; pp. 50-1.) The Republic Steel Corporation has announced a new process for producing steel strip from iron ore without melting. Iron ore is highly purified and reduced to metallic-iron powder. The iron powder is fed between four rolls, where it is compressed into a semi-solid strip with sufficient green strength to hold together. This strip is heated to 1,205 deg. C. in a reducing atmosphere to sinter-bond the iron powder. Hot-rolling furthers the bonding processes and brings the strip to full density and the desired gauge.

Further advancement in the art of powder compaction has been made by Westinghouse. This relatively inexpensive pressing technique produces sheets and bars of uniform density and unrestricted length. The process consists of loading powder into a three-sided box die and compressing the powder in steps with a special punch.

Electron-beam Welding. ANON. (Materials in Design Engineering. 1960. Vol. 51; No. 1; pp. 107-9.) Electron-beam welding was developed to obtain ultra-high-purity welds of reactive and refractory metals, as well as thin sections of nickel and stainless steel in the fields of rocketry and atomic energy. This process is a method of heating the metals in a vacuum and joining them by fusion. After the welding chamber has been evacuated, a tungsten filament is heated to above 2,000 deg. C. and thermionic emission of electrons takes place. A high voltage between the cathode and the pieces to be welded (or an accelerating anode) imparts velocity. It is the value of this voltage, which may range from 2,000 to 150,000 volts, which distinguishes the two basic types of welders. As the electrons are accelerated to the weld area, they are focused into a beam by a simple electrostatic focusing system. Spot diameters for welding generally range from $\frac{1}{32}$ in. to $\frac{1}{4}$ in. The thermal energy is highly concentrated at the metal surface and is sufficient to overcome the capacity of the adjacent body to absorb it through conduction.

Both melting and vaporization occur within a localized area. It is believed that the heat input at the weld joint is concentrated below the work surface, inside the metal. The electrons do not pass entirely through the crevice at the joint because of the pool of molten metal which bridges the gap. It is the high concentration of thermal energy that is responsible for the depth of the welds.

Contemporary equipment has been developed primarily for operation in the 5 to 25 kV., 0.05 to 0.75-amp. range at a maximum electron-beam power of about 7.5 kW. The Zeiss high-voltage equipment operates at 50 to 150 kV at less than 0.015 amp. with a maximum beam power of 1 or 2 kW.

Hot-milling Machine. ANON. (Steel. 1960. Vol. 146; No. 4; pp. 74-5.) This large milling machine which peels scale and surface flaws from hot ingots was developed in Italy by Societa Generale per l'Industria Metallurgica e Meccanica, Milan. Square ingots, stripped at about 790 deg. C. are reheated to 1,200 deg. C. and despatched to the peeling machine for the milling of the four faces. Roller conveyors carry the hot ingots on and off the feeder table, which is positioned by a hydraulic cylinder. A bracket on the feeder holds the face of the work in position as it moves past the cutter. A hydraulic manipulator turns the ingot after each face is milled, so the four sides can be peeled successively.

With water cooling, the cutter blade temperature is 95 deg. C. A layer 0.5 in. or more thick is peeled off each face of the ingot, but this metal can be remelted. The makers of the machine claim that it assists processing by removing flaws while the steel is hot. The machine can handle ingots of up to 5 tons.

Heat Treatment Improves Stainless Steel Welds. R. J. CHRISTOFFEL. (Materials in Design Engineering. 1960. Vol. 51; No. 1; pp. 150-2.) Welds in AIGI 347 stainless-steel (C 0.08 min.; Mn 2.00 max.; Si 1.00 max.; Cr 17-19; Ni 9-13 per cent.) piping should be given a post-weld solution heat treatment to ensure good service life. Cold working during welding reduces the notch-rupture strength of the heat-affected area. This low rupture strength in the presence of welding and service stresses can cause the piping to crack. The post-weld heat treatment (2 hr. at 595 deg. C., 2 hr. at 1,050 deg. C., and air cooling to room temperature) dissolves and spherodizes ferrite in the weld metal, relieves residual welding stresses, and improves the notch-rupture strength of the heat-affected zone.

A SPECIAL STAMP commemorating the tenth anniversary of the Schuman plan is to be issued by the Luxembourg Post Office on May 9. Coloured claret and of a face value of 2.50 fcs., the stamp represents a steelworker outlining with the end of a steel bar, the inscription, CECA (ECSC), against the background of the map of the six member countries of the European Coal and Steel Community.

"Pure and Perfect Iron"

SCIENTISTS working at the Westinghouse research laboratories in the United States have recently developed a considerable amount of "pure and perfect" slivers of iron, with breaking strengths approaching 1,000,000 lb./sq. in.—far greater than any other known metal in the world.

The slivers of iron, or "whiskers" are pure iron crystals, so perfect that no defects can be detected in their structure. The crystals are as much as 2 in. long and 1/1,000 in. thick. Previous attempts to produce these "whiskers" have given crystals which could be observed only with the aid of a microscope.

"Perfect iron" is a forward step in the attempt to gain a broader understanding of the fundamental properties of metals. Because of their strength, hardness, ductility, and other useful properties, metals have always been the backbone of industry, yet all these desirable properties are actually determined not by the metal itself but by the impurities and imperfections it may contain.

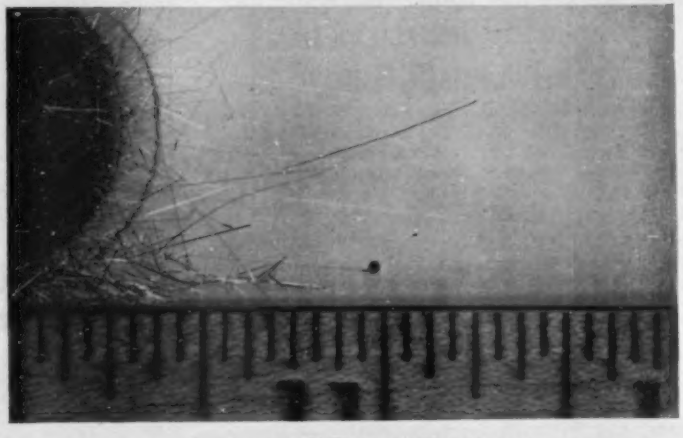
Science knows very little about metals that are completely free of impurities and imperfections, because they are never found in nature and, until recently, could not be prepared in the laboratory. Theoretically, however, we do know that such metals should exhibit remarkable properties which could make them extremely valuable. For example, pure and perfect iron has an ultimate tensile strength of more than 1,000,000 lb./sq. in. This is, at least, 10 times the strength of ordinary iron which has been hard drawn into wire and at least three times the strength of the kind of steel used in making piano wire.

Pure and perfect iron will not emerge tomorrow as a brand new construction material, yet it has been prepared on a scale large enough for scientific study.

The preparation of the perfect iron and testing of its mechanical properties was done by Dr. A. W. Cochardt, Dr. H. W. Wiedersich, and Dr. R. L. Eisner, of the metallurgy department of the Westinghouse research laboratories. The iron is the result of the perfection of a new "whisker-growing" technique which was originated by Dr. John C. Kelly, the company's physical chemist.

The perfect iron "whiskers" were produced in the following manner. Highly purified iron chloride, a common "salt" of iron, is heated in an atmosphere of hydrogen gas inside a special furnace at a temperature of about 600 deg. C. Through rigid control of the temperature and flow of hydrogen, the chlorine atoms in the iron chloride are allowed to unite chemically with the hydrogen at a certain precise rate. This leaves unattached atoms of iron, which "migrate" slowly toward each other and deposit one upon another, in perfect arrangement. Thus, billions of iron atoms "grow" without any observable defects into a single perfect crystal of pure iron, exactly square in cross-section, and often attaining a length of 2 in.

Direct mechanical tests of the iron crystals prove that they have strengths approaching 1,000,000 lb./sq. in., almost the ultimate strength of perfect iron as predicted by theory.



CLOSE-UP OF "WHISKERS" OF IRON.

European Federation of Corrosion

OBJECT of the European Federation of Corrosion, of which the British Association of Corrosion Engineers has been elected a member, is to promote European co-operation in the field of research on corrosion and methods of combating it for the benefit of the community at large. It is a non-profit making union. Membership of the federation is restricted to non-profit making European technical and scientific societies whose activities are connected with the field of corrosion or the protection of materials.

The federation seeks to achieve its objects by convening joint European meetings for the discussion of subjects of general interest, by convening meetings of working parties for the discussion of specific problems, by the creation of working groups for investigating special problems, by the organization of study trips, and by other means. The general secretariat of the federation is managed jointly by the Dechema in Frankfurt a.M. and the Société de Chimie Industrielle in Paris.

The British Association of Corrosion Engineers was formed last year. The address of the hon. secretary is 97, Old Brompton Road, London, S.W.7.

Pig-iron and Steel Production

STATISTICAL SUMMARY

IN the following United Kingdom pig-iron and steel statistics, issued jointly by the Iron and Steel Board and the British Iron and Steel Federation, Table 1 gives the production of pig-iron and ferro-alloys and the number of furnaces in blast in February. Table 2 gives the production of steel ingots and castings in February and Table 3 gives details of deliveries of finished steel in January last. Activities of the industry are summarized in Table 4.

TABLE 1.—*Average Weekly Production of Pig-iron and Ferro-alloys in February, 1960. (Thousands of Tons.)*

District.	Furnaces in blast.	Hematite.	Basic.	Foundry.	Forge.	Ferro-alloys.	Total.
Derbys, Leics, Notts, Northants, and Essex	19	—	26.2	23.4	—	—	49.6
Lancs (excl. N.-W. Coast), Denbighs, Flints, and Ches	7	—	21.5	—	—	0.8	22.3
Yorks (excl. N.-E. Coast and Sheffield)	—	—	—	—	—	—	—
Lincs	10	—	46.5	—	—	—	46.5
North-East Coast	16	2.1	63.4	—	—	—	65.5
Scotland	6	0.7	19.5	1.2	—	—	21.4
Staffs, Shrops, Worcs, and Warwicks	4	—	7.9	1.0	—	—	8.9
S. Wales and Monmouthshire	11	2.4	60.4	1.2	—	—	64.0
Sheffield	2	—	3.6	—	—	—	3.6
North-West Coast	8	16.5	—	1.9	—	1.3	19.7
Total	83	21.7	249.0	28.7	—	2.1	301.5
January, 1960	81	22.1	246.6	26.3	0.3	2.2	297.5
February, 1959	81	20.4	179.0	19.0	0.3	3.1	221.8

TABLE 3.—*Average Weekly Deliveries of New Non-alloy and Alloy Finished Steel. (Thousands of Tons.)*

Product.	1958.	1959.	1959. Jan.	1959. Dec.*	1960. Jan.
Non-alloy steel:					
Ingots, blooms, billets, and slabs‡	4.6	5.1	5.2	5.1	5.6
Heavy rails	10.2	6.8	6.6	6.9	6.9
Sleepers	1.2	0.6	0.6	0.2	0.5
Fishplates and soleplates	0.7	0.4	0.5	0.4	0.4
Plates:					
(i) Over ⅜ in.	29.6	24.8	25.3	26.5	29.2
(ii) Under ⅜ in.	17.7	18.3	16.5	18.3	20.0
Other heavy prods.	41.8	41.2	33.4	48.8	54.7
Ferro-concrete bars	7.6	9.6	6.4	10.0	12.1
Wire rod	21.5	23.5	20.9	25.5	29.4
Arches, etc.	8.6	7.8	8.6	6.4	7.7
Other light sections	29.1	33.0	30.6	38.9	42.0
Bright steel bars	6.2	7.6	6.8	8.5	9.7
Hot-rolled strip	22.6	27.4	24.9	28.7	34.9
Cold-rolled strip	7.0	8.0	7.1	8.9	10.0
Sheets, incl. coated:					
(i) Hot rolled	10.6	11.8	10.3	12.1	12.4
(ii) Cold reduced	31.1	35.2	33.5	34.8	39.8
Tinplate:					
(i) Hot dipped	8.4	7.7	8.7	8.5	7.5
(ii) Electrolytic	10.3	13.2	13.1	13.8	15.2
Blackplate	0.8	0.7	0.8	0.7	0.7
Tubes up to 16 in.	19.0	20.6	19.4	22.1	25.7
Tube fittings, etc.	0.4	0.4	0.4	0.4	0.4
Tyres, wheels, and axles	4.5	2.4	3.3	2.0	2.7
Forgings (excl. drop)	2.6	2.1	2.5	1.9	2.1
Steel castings	4.2	3.6	3.6	3.7	4.2
Tool steel, etc.	0.2	0.2	0.2	0.2	0.3
Total	300.5	312.0	289.2	333.3	374.1
Alloy steel	16.1	18.2	16.2	19.5	23.0
Total deliveries from UK production†	316.6	330.2	305.4	352.8	397.1
Add: Imported finished steel	7.0	7.1	3.9	8.1	12.1
	323.6	337.3	309.3	360.9	409.2
Deduct: Intra-industry conversion§	41.2	47.6	44.2	49.2	57.1
Total new material	282.4	289.7	265.1	311.7	352.1

† Includes finished steels made from imported ingots and semis.
‡ Other than for conversion into any other form of steel listed.
§ Material for conversion into other products also listed in this table.

TABLE 2.—*Weekly Average Production of Steel Ingots and Castings in February, 1960. (Thousands of Tons.)*

District.	Open-hearth. Acid.	Open-hearth. Basic.	Bessemer.	Electric.	All other.	Total. Ingots.	Total. Castings.	Total ingots and castings.
Derbys., Leics., Notts., Northants, and Essex	—	4.8	16.8 (basic)	2.7	0.1	22.9	1.5	24.4
Lancs. (excl. N.-W. Coast), Denbighs., Flints., and Ches.	1.0	39.6	—	5.5	0.3	44.9	1.5	46.4
Yorkshire (excl. N.-E. Coast and Sheffield)								
Lincs.	—	53.1	—	—	0.1	53.1	0.1	53.2
North-East Coast	0.8	92.3	—	1.5	0.4	93.1	1.9	95.0
Scotland	1.5	49.3	—	3.7	—	52.3	2.2	54.5
Staffs., Shrops., Worcs., and Warwicks.	—	23.0	—	4.4	0.8	26.3	1.9	28.2
S. Wales and Monmouthshire	2.0	93.1	16.9 (basic)	0.9	0.1	112.6	0.4	113.0
Sheffield (incl. small tonnage in Manchester)	8.8	36.9	—	14.7	0.4	58.6	2.2	60.8
North-West Coast	—	—	5.8 (acid)	0.9	—	6.6	0.1	6.7
Total	14.1	392.1	39.5	34.3	2.2	470.4	11.8	482.2
January, 1960	12.6	386.6	37.9	32.1	2.2	460.2	11.2	471.4
February, 1959	11.9	288.3	22.2	23.0	2.0	337.7	9.7	347.4

TABLE 4.—*Iron and Steel Index and General Summary of Pig-iron and Steel Production. (Weekly Average in Thousands of Tons.)*

Period.	B.o.T. Price Index, 1938 = 100. Iron and steel.	Coal.	Basic materials§	Iron-ore output.	Imported ore used.	Coke sent to blast-furnaces.	Pig-iron, ferro-alloys prod.	Scrap used in steel prod.	Steel (incl. alloy). Imports.†	Prod. ingots, castings.	Delivrs. finished steel	Stocks.‡
1957	328	488	537	325	303	270	275	220	14	417	322	2,580
1958	343	403	478	276	262	227	245	196	9	369	284	2,242
1959	340	497	477	286	244	210	242	208	7	388	291	2,244
1960—Feb.	338	501	487	333	320	256	302	250	15	482	374	2,260

* Months contain five weeks, all tables. ‡ Stocks, ingots, semi-finished and finished steel, at the end of the years and months shown.
† Weekly average of calendar month. § Used in non-food manufacturing industries.

Law Cases

COAL COMPANY DISSOLUTION

Sixth Petition Over Tax Deductions

SIXTH petition in recent weeks has been presented to the Court of Session for an order declaring void the dissolution of a coal company under the Coal Industry Nationalisation Act, 1946. As with the other five cases, this petition arises from the House of Lords decision last year in the case of Whitworth Park Coal Company, Limited (in liquidation) *v.* Commissioners of Inland Revenue. The petitioner holds that the Ministry of Fuel and Power, in the light of that judgment, was not entitled to make certain deductions in the name of income tax from payments made to members of the company as compensation on nationalisation.

The petition is brought by Mr. James T. Dowling, of Glasgow, liquidator of Archibald Russell, Limited, coalmasters, of Glasgow. Originally, the company had a share capital of £500,000 but this was increased in 1920 to £1,500,000. Between vesting date and February 9, 1955, the company received interest and revenue payments from the Ministry under the provisions of the Act(amounting to £82,968.

The Ministry deducted sums totalling £37,503 from these payments as income tax at the standard rate then in force.

"Wrong Deductions"

Originally, the petitioner believed the sums had been validly deducted, but in view of the House of Lords ruling he now sought to have the company restored to the register so that claims might be made for recovery of the sums wrongly deducted. He understood that after payment of tax at the appropriate rate a balance would remain for division among the members of the company.

An order has been made by the Vacation Court for public intimation of the petition and service on the Lord Advocate, and seven days has been allowed for lodging of answers. Last month, Lord Walker granted an order declaring void the dissolution of Bairds & Dalmellington, Limited. Four other similar petitions are before the court.

[The House of Lords decided in the Whitworth Park case that the Ministry was not entitled to deduct income tax at the standard rate from payments of interim income made under the 1946 Act and the Coal Industry (No. 2) Act, 1949, to former colliery companies and coalmasters. It was held that the payments were assessable under Case III of Schedule D. Presenting his Budget, however, the Chancellor of the Exchequer said that he proposed to deal with the difficulties which flowed from the House of Lords judgment.]

"Stampede" to Pit Cage: Attendant's Claim Fails

REFERENCE to an underground stampede of 20 men to get into a cage taking a capacity load of 40 miners to the surface at Frickley Colliery, was described by Mr. Justice Slade at Leeds Assizes. Mr. Friend Pickard (33) pit bottom cage attendant, who received chest injuries when pinned against the wall of the cage unsuccessfully sued the National Coal Board for alleged negligence.

The judge said that 150 men were waiting to use the cage and 40 were counted inside. Mr. Pickard was about to take the pin out of the inner gate cage when he was swept to one side. "Twenty men had rushed," the judge went on, "with the avowed intention and determination to get into the cage and oust as many of the 40 men as was necessary to secure their own admittance.

"They caused a veritable stampede. In the crush which ensued, regardless of the fact that they well knew they were not only breaking the law, but committing a criminal offence, they were determined to thrust aside anyone and to deal with anyone who obstructed their intentions." Mr. Pickard had alleged, the judge continued, that the NCB failed to provide a safe system of working, but he found that the NCB took reasonable care for his safety.

Mr. Pickard had also alleged, said the judge, that the 20 miners who caused the stampede were servants of the NCB and were negligent. The judge found they were not acting in the course of their employment. Giving judgment with costs for the NCB, the judge said: "I have every sympathy with the plaintiff, but I cannot allow my sympathy to affect my judgment."

Exporters Fined £10,000 for "Scrap" Plates Offences

FIRM of merchants and exporters was fined a total of £10,000 at the Old Bailey after being found Guilty of conspiracy to cheat and defraud the Board of Trade concerning a licence to export 2,000 tons of secondhand cast-iron chequer plates by pretending they were being exported for flooring when they were intended as scrap. The firm, Baker Bosly, Limited, Ripley (Surrey), was also convicted on six counts of being knowingly concerned in the export of the plates with intent to evade the prohibition then in force.

Prosecuting, Mr. Sebag Shaw said that it was arranged to export the plates as scrap by representing they were being sold to Baker Bosly Italia, Limited, of Milan, as flooring. After submitting a bogus contract to the Board of Trade, an export licence was granted. Mr. Roger Frisby, defending, said that Mr. H. A. Whichelow and Mr. A. C. Carvalho (two directors) were men of good character who knew

nothing of the negotiations. There was no evidence that they took any active part in the business of Baker Bosly, Italia, and legal proceedings were to be taken against the Italian company.

The Common Serjeant, Judge Aarvold, ordered the company to pay costs not exceeding 600 guineas.

SHOTFIRING ACCIDENT

FORMER ironstone miner who received back and other injuries in a "disastrous" shotfiring accident in an underground tunnel was now doing an "old man's job," it was stated at Durham Assizes. The miner, Mr. Dennis Parker (39), who sued his employers, Dorman, Long (Steel), Limited, was awarded £5,352 damages with costs.

His counsel, Mr. Henry Scott, said it was a very simple case of gross negligence by a deputy who had "set the thing off" as Mr. Parker was walking back after connecting up the wiring for the shotfiring. The deputy's "extraordinary behaviour" was probably due to his being deaf and possibly not hearing Mr. Parker say he was going to link the wiring. In his judgment, Mr. Justice Sachs said the deputy appeared to have been suffering from deafness to a degree which made one startled that he should be employed in the job in which he was appointed at the time.

MR. GEORGE HENRY HINCHCLIFFE (49), who received neck and leg injuries in a fall of stone at Darfield Colliery in 1954, was at Leeds Assizes awarded £3,000 damages and costs against the National Coal Board.

AN ELECTRICIAN FAILED at Durham Assizes in his claim for damages against Underground Mining Machinery, Limited, of Aycliffe (Co. Durham). The plaintiff, Mr. Harry Nicholson (27), claimed that his hand was severely burned in an accident in August, 1955.

MR. JOHN THOMPSON (37), who lost part of a thumb in a pit accident nearly five years ago, was awarded £550 damages and costs at Durham Assizes. He sued the National Coal Board for damages for personal injuries, alleging negligence and breach of statutory duty.

MINER WHOSE left leg was injured by an overhanging stone which fell from the face at Easington Colliery, was awarded £1,172 damages with costs at Durham Assizes. The plaintiff, Mr. William Laverick (49), sued the National Coal Board for alleged negligence, claiming that the stone should have been removed.

WHEN AN underground tram was derailed at Frickley Colliery, Mr. Ernest Gilbert (52), material man, suffered a compound break of his left leg, it was stated at Leeds Assizes. Mr. Justice Slade awarded damages of £980 with costs to Mr. Gilbert, who sued the National Coal Board for damages for personal injuries.

JUDGMENT FOR £2,358 with costs, was awarded at Durham Assizes to Mr. Michael Swainston (37), who sued his former employers, West's Gas Improvement Company, Limited, of Manchester. Mr. Swainston, formerly a welder-erector, was said to have suffered paralysis of the shoulder muscle since being hit by a falling piece of wood.

DAMAGES OF £3,079 9s. 10d. were awarded against the National Coal Board at Durham Assizes to a miner, Mr. John Fenwick, who received head injuries when he was hit by a machine handle underground in Easington Colliery two years ago. Mr. Justice Winn was asked to enter judgment by consent for the damages, but made no order as to costs.

Non-ferrous Metals

Problematical Future for Copper

WHAT will happen to the price for cash copper in the immediate future depends on a number of factors. There is the possibility of the whole of the Chilean copper industry coming to a halt. If a strike takes place the shortage of copper on this side of the Atlantic may well become serious. Stocks of copper in LME warehouses are at their lowest level for four years, and there is plenty of US metal in this country, but there are several difficulties about marketing it.

One snag is that US exporters must satisfy their own authorities that the ultimate destination of the metal is not Communist, an undertaking the potential British buyer is sometimes not in a position to give. Then, it is said that two out of the three US producers do not want to deliver their metal to the London Metal Exchange. Finally, some of the US copper is not the right shape so that there is not a great demand for it.

In the future, too, much will depend on the situation in South Africa and the Belgian Congo. Indeed, only in the US would there seem to be more copper available than anyone knows what to do with. This is because production is now going full blast and is outrunning consumption. Nevertheless, the price levels are still holding at 33 cents a pound for both custom smelters and producers.

Tin continues steady in London and dull in Singapore. The US market is apparently quiet, it is stated, "because Indonesian ore is finding its way increasingly to the Texas smelter, that the US is using more secondary metal, and owing to the stability of prices there is now not nearly so much buying forward." However, the Indonesian situation is the most important for if this position continues there will not be the need for the US to supplement its supplies from the Straits and the American market price level may remain for long periods out of alignment with the London Metal Exchange and the European market. At present the US price is fluctuating narrowly around 99 cents a pound.

Lead continues steady in London and only fair in New York where the price is quoted at 12 cents a pound. In London the report has been made that for the first time in several months Spanish metal has arrived in the country which suggests that the usual sources of supply—Australia and Canada—are not sufficient to meet the present demand.

Zinc remains a basically strong and satisfactory market in London. The backwardation is tending to increase slightly and the undertone is strong. The US market is only fair and the price is unchanged at 13 cents a pound, East St. Louis.

Official metal prices in London yesterday (Thursday) were:—COPPER, Standard: Prompt £259 10s., forward £247. TIN, Standard: Prompt £793 10s., forward £784 10s. LEAD: Prompt £77 12s. 6d., forward £76 10s. ZINC: Prompt £94, forward £91.

EXPANSION BY Winston Electronics, Limited, Shepperton (Middx), in the field of engineering sub-contracting, follows from the company's association with the Dynamics Corporation of America as a self-governing subsidiary. The necessary capital resources have become available to enable the company to double its size and re-equip completely.

IRON AND STEEL TRADE

THE steel boom continues. The essential fact is that since the beginning of the year the phenomenal increase in production represents no more than the industrial response to an increase in domestic demand unequalled within living memory. Confidence, moreover, is justified by the development of similar conditions in the European Coal and Steel Community. Outputs of rolled steel products in Western Germany in the first quarter of this year increased by nearly 40 per cent. (compared with a 35 percent. rise in the UK), and French production last month was the highest ever.

Pig-iron

A noticeable feature of the pig-iron trade is the concentration of blastfurnacemen on the provision of basic qualities. Whereas production of foundry grades is no more than steady, consumption of steelmaking iron is increasing more rapidly than the output, and is now 36 per cent. above the figures for the first quarter of last year.

Even this figure is not enough. Steelmakers' stocks of iron are still in a state of decline, but the distortion has not got out of hand and more blast furnaces of modern design and high capacity will soon be ready for operation.

Ferro-alloys

Despite the intervention of Easter, little change is noted in the demand for most items; in general, active conditions continue. There is no change in the price of ferro-tungsten; ferro-silicon continues to attract strong support, and interest in ferro-chrome is maintained. Calcium silicide is fairly active, and there is a good demand for ferro-manganese and silico-manganese.

Steady attention is given to ferro-niobium, and ferro-titanium is quite active. Ferro-vanadium and ferro-molybdenum are in fair request, and there is a steady call on chromium metal.

Semi-finished Steel

Deliveries of re-rolling blooms, billets, and slabs in the first two months of this year were very nearly 50 per cent. better than in the corresponding period of 1959, but supplies still fall short of requirements and small marginal tonnages are now being imported.

Happily the gap to be so bridged is very narrow and if at times the re-rolling mills are operating on a hand-to-mouth basis, the steelworks are able to cover fairly adequately their customers' and their own requirements.

Finished Steel

The export trade in finished steel products is a little less active, but the level of British prices ensures for our manufacturers a reasonable share of oversea business. The capacity of the rolling mills is, however, fully tested by an unrelenting home demand.

Requisitions for constructional engineering works and road building have reached their highest peak and bottlenecks have only been avoided by exceptional performances at producers' works.

The pattern of demand has not changed. Rail orders are scarce and the best that can be said of shipbuilders' specifications is that there has been no uplift. But for all other types of steel products ranging from small bars and sections to heavy beams and joists there is unceasing pressure and the expansion of the steel industry's own re-equipment programme is absorbing considerable tonnages of varied types of finished steel products.

Iron-ore Imports

IMPORTS of iron ore and concentrates (except chrome iron ore and roasted iron pyrites) in March, and the totals for the first three months of this year and last, are shown in the table below.

From	Month ended Mar. 31.	Three months ended March 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Sierra Leone	64,340	149,724	207,550
Canada	—	102,040	223,405
Other Commonwealth countries and Eire	1,050	3,300	6,275
Sweden	442,549	687,103	1,182,610
Norway	18,848	93,862	77,153
France	68,686	100,932	161,829
Portugal	9,498	42,297	74,156
Spain	86,245	120,324	215,857
Algeria	269,601	462,064	594,434
French West Africa	—	74,026	—
Tunisia	77,180	190,406	198,427
Morocco (excluding Tangier)	50,525	119,566	188,767
Liberia	77,350	99,540	152,570
Venezuela	125,576	375,461	427,797
Brazil	41,737	132,980	151,270
Other foreign countries	65,583	30,400	183,184
TOTAL	1,398,768	2,784,025	4,045,284

Swedish Steel Plant Plans in India

LICENCE to build a factory at Poona, about 150 miles east of Bombay, has been granted to Sandvik Steel Works, Sandviken, Sweden. Both tungsten-carbide bits and finished products will be produced, and the total investment in land, buildings, and machines is estimated at £550,000.

An Indian company, Sandvik Asia, Limited, will be formed to take charge of planned production, and Mr. Dharamsey M. Khatau, a well-known Indian industrialist, will be a member of its board. The project will be financed by Swedish and Indian capital, it is stated.

Production will start next year. Initially the factory will be under the leadership of Swedish engineers who will introduce Swedish production methods. A staff of Indian technicians will be trained gradually.

THE NAME of George Clark & North-Eastern Marine (Sunderland), Limited, has been changed to George Clark (Sunderland), Limited. The company is a subsidiary of Richardsons, Westgarth & Company, Limited.

Appointments

Engineering Director for R & H

RECENTLY appointed engineering director of Ruston & Hornsby, Limited, engineers, steel and iron founders, etc., of Lincoln, is Mr. C. J. HIND.

MR. C. J. HIND

He began his career with the firm and in 1940 transferred to its associated company, Davey, Paxman & Company, Limited, where he assisted in the design of the diesel engine which powered tank landing craft during the war. He became chief experimental engineer to Dennis Bros. & Company, Limited, Guildford, after the war, but returned to Davey Paxman as chief designer in 1949 and later was made chief diesel engineer. He transferred to Ruston & Hornsby in 1957 as chief engineer (engines).

Mr. J. W. MARTIN has been appointed production controller, engineering division of Newton, Chambers & Company, Limited, Thorncliffe, in succession to Mr. J. B. Bilton.

Dr. W. J. WADSWORTH has been appointed Lecturer in Geology at the University of Edinburgh. Dr. Maxwell Davidson, Senior Lecturer in Engineering, is to resign on September 30.

Mr. M. H. BEATTIE, formerly London sales manager of Scottish Cables, Limited, has been appointed assistant sales manager (power cables) of British Insulated Callender's Cables, Limited.

Mr. G. E. DODDS, works engineer with Hawthorn Leslie (Shipbuilders), Limited, Hebburn (Co. Durham), has been appointed outside manager for MacGregor & Company (Naval Architects), Limited, Whitley Bay (Northumberland).

Gen. Sir CAMPBELL HARDY, former commandant general of the Royal Marines, has been appointed director of the Coal Utilisation Council as from May 2, in succession to Mr. J. S. Williams, who takes up an appointment as a deputy director-general of marketing, National Coal Board, on that day. Sir Campbell is 53.

Mr. T. ARBLASTER has been appointed manager of Shireoaks Colliery in the No. 1 Workshop Area of the North-Eastern Divisional Coal Board, and Mr. J. L. HARRINGTON has been appointed manager of Newmarket Silkstone Colliery and Mr. R. BOOTH manager of Prince of Wales Colliery in No. 8 (Castleford) Area.

Mr. LAURIE F. EVERARD has been appointed managing director of the H. Leverton & Company, Limited, group. Mr. FRED PARNHAM becomes general service manager of the group and he is succeeded as service manager of Leverton of Leeds, Limited, by Mr. HARRY BRAMHAM. Mr. GERRY MOUSLEY has been appointed civil engineering consultant for the group.

Mr. E. ELLIS, sales manager (forgings) of the English Steel Corporation, Limited, Sheffield, has been appointed sales manager (forgings and heavy plate), on the retirement of Cmndr. BLOOD who joined the Corporation in 1946. Mr. L. K. MACHIN has been appointed manager of the forging sales department and Mr. R. MATTHEWS becomes manager of the heavy plate sales department.

Mr. E. W. MOLESWORTH has been appointed chief engineer for the London, southern, and eastern areas of the engineering group of the General Electric Company, Limited. He was manager of the company's Penang agency in 1936, appointed a director in 1954, and manager of the London office of the Erith engineering works in 1956. He was appointed personal assistant to Mr. A. L. Lindley, vice-chairman and managing director of GEC, two years later.

New appointments are announced in the large electrical machine sales department of the Associated Electrical Industries, Limited, heavy plant division as a result of increasing business in the steel and non-ferrous metal industries. Mr. N. R. D. GURNEY has relinquished his position of manager of the department at Manchester to concentrate on furthering the division's interest in these markets at home and abroad. He will remain a member of the executive of the division. Mr. I. A. FERGUSON, formerly manager of the department at Rugby, now assumes responsibility for the entire department. New assistant manager is Mr. J. CANNELL, who joined Metropolitan-Vickers Electrical Company, Limited, now AEI (Manchester), Limited, as a college apprentice in 1939.

Lincolnshire Iron & Steel Institute

LIVELY speeches and a record attendance marked the occasion of the 27th annual dinner of the Lincolnshire Iron and Steel Institute, held at Scunthorpe last Friday.

The toast, "The Iron and Steel Industry and the Lincolnshire Iron and Steel Institute," was proposed by the Earl of Gainsborough, from whose estates much of the iron ore smelted at Scunthorpe is obtained.

Mr. W. Barr and Mr. J. D. Townsend, presidents of the Iron and Steel Institute and the Lincolnshire Iron and Steel Institute, respectively, responded.

The guests were welcomed by Mr. D. Bruce-Gardner, joint managing director of John Lysaght's Scunthorpe Works, Limited, and the Rt. Rev. K. Healey, Bishop of Grimsby, responded.

NUM Conference to Study National Fuel Policy

STUDY conference was held by the National Union of Mineworkers in London recently to consider the facts and issues involved in the controversy over questions of national fuel policy and the present position of the coal industry. The participants were chiefly leading figures from industry, commerce, and the nationalised industries.

The three papers given were: "Coal—the Next 50 Years," by Mr. E. F. Schumacher, economic adviser to the National Coal Board; "Coal—the Present Situation," by Mr. S. Kossler, economic research officer of the NUM; and "Coal and Science," by Dr. T. A. Townend, director-general, British Coal Utilisation Research Association. Chairman was Sir Geoffrey Crowther.

THE COAL TRADE

JUDGING by the steady decline in merchants' stocks reported by the Ministry of Power, it would appear that they are reducing orders to a minimum and working off stocks as far as possible in anticipation of summer prices. Although it is reported from some areas that trade in April has been better than in April, 1959, a sudden drop in temperature no longer has much effect on sales. Industrial activity is reflected in this side of the coal trade and it is serving to throw into prominence the labour problem—one that is not likely to ease for some time.

DERBYSHIRE

Most merchants are occupied with discharging small orders where consumers' coal stocks are exhausted. Less urgent stocking awaits the introduction of summer prices next week. All grades are in limited demand, with best and handpicked particularly quiet. The better types of screened cobbles and brights attract an occasional inquiry and interest in cheaper brights is only slightly better. Best large nuts are quiet and demand for washed medium and small nuts is confined to immediate requirements for small quantities.

The domestic coke market is also quiet, with only a few orders for small quantities. This is also true of domestic anthracite, although some orders are in hand for the beginning of May. The demand for smokeless fuels is also falling off, but is expected to revive next week.

Industrial coal supplies are in normal request and forwardings are satisfactory. Nutty slacks are readily obtainable. The demand for dry screened nuts continues to absorb all available tonnages, and supplies are flowing satisfactorily. Washed fuels are easier as the demand for central heating declines. There are sufficient hard steams to meet a fair request. The industrial coke market is slack with only occasional orders for all grades.

Mines Mechanisation and Accident Rates

MISINFORMED by a correspondent, we inadvertently, in our issue of April 15, attributed to Mr. H. Rodway, safety engineer of the Mid-Northumberland Area of the Northern (N&C) Divisional Coal Board, statements which he did not in fact make when addressing members of Bedlington Toc H Club.

The confusion appears to have arisen out of two questions put after the address. Asked whether the increase in mechanisation was the cause of the increase in the accident rate, Mr. Rodway said the rate was in fact less, but when an accident did occur it tended to be of a more serious nature than one on a conventional face.

In reply to another question Mr. Rodway said the figure for the accident rate before nationalisation was not available, but the absentee rate had increased from 5.2 per cent. pre-nationalisation to 10 per cent. at the present time.

Mr. Rodway informs us that in Mid-Northumberland, as elsewhere, the accident rate is lower on mechanised and/or prop-free front faces than on conventional faces and we much regret any misunderstanding which may have arisen.

Miners' Relief Society Membership Drops by 3,000

MEMBERSHIP reduction of 3,197 to 28,737 is revealed in the 87th annual report of the Lancashire and Cheshire Miners' Permanent Relief Society. The report points out that the drop was caused chiefly by colliery closures and the reduction of manpower in other collieries in the area. Only a few members had withdrawn because of increased contribution rates.

Relief paid in 1959 totalled £66,895 18s. 7d., an increase of £4,826 6s. 1d. on the 1958 figure. There were 77 fatal accidents last year, representing 2.68 per 1,000 members. Non-fatal mining accidents rose from 6,958 to 7,470. The number of new pneumoconiosis cases dropped by 31 to 219, but the total on the funds was 1,712, an increase of six.

Available balance at the close of the year was £399,979 8s. 3d., and the benefit fund dropped by £271 3s. 1d. to £393.211 16s.

Welsh Coal Industry "Turning the Corner"

COAL industry in South Wales was now "turning the corner," Mr. Eric B. Thomas, purchasing and stores controller of the South-Western Divisional Coal Board, told the Welsh Board for Industry on Monday. Exports of Welsh coal during the first three months of this year were 100,000 tons higher than a year ago and there had been a big fall in pithead stocks.

Looking to the future, Mr. Thomas said that Aberthaw and Uskmouth "B" power stations would use 2,000,000 tons of coal a year and in 1961 the coke-oven plant at the Llanwern steelworks would consume at least 1,000,000 tons a year.

NCB CHANGE OF FRONT DENIED

ALLEGATION by Mr. Leonard Jones, secretary of the 2,800-strong Rossington Colliery NUM branch that there had been a change of front by the NCB on mechanisation, has been denied by a Coal Board spokesman.

The latter said: "There has been a temporary delay in the present mechanisation programme as Rossington. The reason is purely that at present there is a demand for large coal, and as machines become available which will produce large coal in the amounts required mechanisation at the pit will proceed. This curtailment is solely because of the marketing situation. There is no question of a change of front in the long-term policy."

Orders Placed

Clarke, Chapman Wins £6,000,000 Plant Order

MANUFACTURE and erection of steam generating plant to be installed at Blyth "B" generating station, Northumberland, will be carried out by Clarke, Chapman & Company, Limited, of Gateshead. The contract, worth about £6,000,000, has been awarded by the Central Electricity Generating Board. The installation will comprise two units each capable of generating 2,350,000 lb. of steam an hour at a pressure of 2,400 lb. a sq. in. and a temperature of 1,055 deg. F.

They will be the largest units to be installed in the north-east and each will supply enough steam to generate more power than the total five units installed at Stella South generating station, Blaydon-on-Tyne, by the same company a few years ago. The total planned output of Stella South was 300 000 kW an hour, whereas the two Blyth units will together generate 700,000 kW. The plants will be pulverised coal fired and at full output will need up to 2,000,000 tons of coal a year, thus providing an additional outlet for local collieries. Consulting engineers to the CEGB will be Merz & McLellan, of Newcastle-upon-Tyne.

CONTRACT for the supply of steel pipes worth £46,350 has been placed with the South Durham Steel & Iron Company, Limited, by Durham County Water Board for the projected Derwent reservoir.

EXHIBITING AT the West German air show in Hanover this week, D. Napier & Son, Limited, of London, W.3, has won an order worth at least £1,500,000 for de-icing equipment from a West German company.

CARLISLE CORPORATION has accepted the tender of Stanton Ironworks Company, Limited, Nottingham, of £69,873 for the supply of pipes and specials in connection with a water extraction scheme on the river Eden.

P. G. ENGINEERING, LIMITED, Stockton-on-Tees (a member of the Power-Gas Group) is to engineer, design, and install a monomer plant and external services as a major stage in a project for the production of polyvinyl chloride for the Distillers Company, Limited.

CONTRACT FOR THE supply of rails to the Sierra Leone Railways has been obtained by the Guest Keen Iron & Steel Company, Limited. The contract, which was negotiated through the Crown Agents for Oversea Governments and Administrations, is worth about £83,000.

AN ORDER FOR 174,000 ft. (33 miles) of wire rope is being speedily dealt with in the Whifflet (Lanarkshire) works of Frew Bros. & Company, Limited, so that the rope can be on its way to India before the end of this month. The contract was obtained in the face of strong oversea competition.

FOUR MORE evaporating vessels for a Russian sugar beet works have been ordered from George Clark (Sunderland), Limited, following the completion of an order for 10 similar vessels recently. The company also has a contract for the propelling machinery for a 10,000-ton cargo ship being built by Austin & Pickersgill, Limited.

NEW RISE in pithead coal stocks in ECSC countries occurred last month. Provisional figures show that the total rose from 30,295,000 tons in February to 31,298,000. This reversed the downward trend of the first two months of the year.

Inco Earnings Will be "Significantly Higher"

NET earnings by the International Nickel Company of Canada, Limited, for the first quarter of this year will be "significantly higher" than the $16,900,000 reported for the first quarter of 1959, announces the chairman, Dr. John Thompson. Nickel deliveries in March tapered off slightly from the extraordinarily high levels of the first two months, but the rate of deliveries for the quarter was greater than production.

Demand for nickel is expected to remain strong throughout the current year, though, unlike the pattern of earlier post-war years, potential world supply is now more than adequate. Dr. Thompson believes that the current expansion in nickel use should continue.

Engineers to Claim £1-a-Week Rise

WITHIN the next few weeks, engineering and shipbuilding employers will be faced a demand for wage increases for 3,000,000 workers. The increases, if granted, would add about £150,000,000 a year to the costs of industry. A resolution calling for an unconditional rise of at least £1 a week, with payment backdated to the beginning of negotiations, was passed unanimously at Blackpool on Wednesday by the policy-making national committee of the Amalgamated Engineering Union.

The claim will be submitted to the Confederation of Shipbuilding and Engineering Unions for discussion at its annual conference in June.

In Parliament

Industrial Development

REFERENCES to the machine-tool industry and new processes in steelmaking were made by MR. JOHN OSBORN (Con. & Lib.) in a debate on a private Member's motion. Mr. Osborn, who is a director of the Sheffield steelmakers, Samuel Osborn & Company, Limited, and a member of the Iron and Steel Institute, spoke of the huge scope for technological achievement existing in the machine-tool industry.

Many individual firms, he said, were aware of the challenge and opportunities lying ahead and were taking steps to develop their design and research resources. One instance of the "exciting developments" going on throughout industry was the production of boiler drums for the new and larger power stations. Such vast boiler drums were required that it was almost impossible to erect a forge capable of making them. "The solution has come from another industry," he said. "The welding industry has stepped in."

Mr. Osborn referred to other developments sponsored and aided by research organizations, and cited oxygen injection for steel melting. In a furnace it was possible to raise capacity by from 30 to 50 per cent. by the injection of oxygen. That had faced some steel firms with surplus melting capacity and insufficient rolling mill capacity with which to process the steel. Continuous casting had provided a reasonable alternative, he said.

Company News

Good Prospects for Sir William Arrol

FORWARD prospects for the crane works are reported to be good by Sir William Arrol & Company, Limited, bridge builders and engineers, of Glasgow. A new heavy erection shop will soon be completed and fully occupied in coping with large cranes already on order and those expected. In addition, a further extension is envisaged.

A dividend of 20 per cent. (15 per cent. plus 3¾ per cent. net from capital profits) is proposed along with a one-for-one scrip issue. The net profit for 1959 rose from £216,559 to £292,524.

BELGRAVE (BLACKHEATH), LIMITED, stampings and pressings—As forecast the dividend is 17½ per cent. for the year to January 31, 1960.

NEWMAN INDUSTRIES, LIMITED, electrical and mechanical engineers, of Bristol—The dividend for 1959 is raised from 10 to 12½ per cent.

GEORGE M. WHILEY, gold beaters and stamping foil makers, of Ruislip (Middx)—Final dividend of 12 per cent. makes 17 (14) per cent. for 1959.

E. V. INDUSTRIALE, LIMITED—A final dividend of 15 per cent. is being paid, making 25 (20) per cent. for 1959 on capital increased by acquisitions.

F. FRANCIS & SONS (HOLDINGS), LIMITED, metal container makers, of London. S.E.13—Total dividend is raised by 3 per cent. to 23 per cent. for 1959.

W. TYZACK, SONS & TURNER, LIMITED—An interim dividend of 4 per cent., tax-free, on the ordinary capital increased by a one-for-two bonus issue is proposed.

S. E. OPPERMAN, LIMITED, engineers, and gear cutters, of Elstree (Herts)—There was a group loss of £40,090 during 1959 and, as in 1958, no dividend is to be paid.

ANTI-ATTRITION METAL COMPANY, LIMITED—Group net loss for 1959 was £92,033 (£11,137). The chairman, Mr. H. Wilmot, states that the company is now making profits.

LILLESHALL COMPANY, LIMITED, structural engineers, etc., of Oakengates (Salop)—No dividend on ordinary for 1959 (7½ per cent. less tax), but capital distribution of 1½d. per 2s. share, not subject to tax.

JOHN DALE, LIMITED, non-ferrous castings, etc., of London, N.11—Net profit after taxation was £189,714 (£69,685). The chairman, Mr. Robert Carr, says that the forward position appears satisfactory.

LAURENCE SCOTT & ELECTROMOTORS, LIMITED—The dividend is raised from the equivalent of 12⅝ per cent. to 15 per cent. on a capital increased by a one-for-six scrip issue, with a 10 per cent. final for 1959.

VICKERS, LIMITED—Sales in 1959 were £155,540,000 (£176,850,000) and the net profit dropped to £4,930,000 (£6,590,000). The final dividend is maintained at 7½ per cent., making the annual total 10 per cent. for the fifth successive year.

WILLIAMS & WILLIAMS, LIMITED, manufacturers of metal windows, door frames, etc., of Chester—The preference dividend payment for the half-year ending April 30, 1960, is to be postponed pending the consideration of the year's accounts.

R. W. CRABTREE & SONS, LIMITED, engineers, printing machine manufacturers, etc., of Leeds—The company has the largest order-book ever, and the prospect of a still further expansion in orders is a "very live one," states the chairman, Mr. C. H. Crabtree.

SANDERSON BROS. & NEWBOULD, LIMITED, steel manufacturers, etc., of Sheffield.—Group trading profit for 1959 was £416,551 (£334,818). It is hoped to send out on May 6 full particulars of the terms of the proposed merger with Kayser, Ellison & Company, Limited.

TUBE INVESTMENTS, LIMITED—Dividend is raised from 7½ per cent. to 8½ per cent. on £16,800,000 capital for the year ending July 31, 1960. A final dividend of not less than 8½ per cent. has been forecast on the capital doubled to £33,600,000 by the recent rights issue.

CHARLES ROBERTS & COMPANY, LIMITED, rail and road vehicle manufacturers, etc., of Wakefield—As a result of further consideration of the possibilities of a merger with the Birmingham Railway Carriage & Wagon Company, Limited, the board has decided to abandon negotiations.

HALESOWEN STEEL COMPANY, LIMITED—The board expects to pay an interim ordinary dividend of 4 per cent. in September. This compares with 4 per cent. paid prior to a one-for-five scrip issue. Mr. C. S. Burch, the chairman, says that the situation for the remainder of 1960 seems "set fair."

HOPKINSONS, LIMITED, bronze, iron, and steel founders, engineers, etc., of Huddersfield—The final dividend is raised to 15 (10) per cent., making 22½ (17½) per cent. for the year to January 31, 1960. Group profits increased to £1,095,923 (£913,848) and the net balance is up from £456,598 to a record £575,423.

SOUTH AFRICAN COAL, OIL & GAS CORPORATION—The chairman, Dr. F. J. Du Toit, states that this year a net profit will be shown for the first time since the start of production in 1954. Annual output was now 40,000,000 gallons, or 10 per cent. of the country's consumption. Turnover had increased to an annual rate of £8,000,000.

E. N. V. ENGINEERING COMPANY, LIMITED, gearing specialists, of London, N.W.10—Group net profits were £275,059 (£254,993), after tax of £242,853 (£239,401). Final dividend of 16 per cent. and a jubilee bonus of 2½ per cent. makes 22½ (17½) per cent. In 1958 holders received a 50 per cent. scrip issue, half in preference and half in ordinary shares.

MAVOR & COULSON, LIMITED, mining equipment manufacturers, of Glasgow—Group net profit fell from £365,435 to £162,032 in 1959, after tax of £106,753 (£314,479). The dividend is maintained at 10½d. per 10s. share, with a final of 6d. per share on the capital increased by the shares issued against the acquisition of Austin Hoy & Company (Holdings), Limited.

BRITISH ROPES, LIMITED—A rights issue to raise approximately £2,000,000, and a subsequent 100 per cent. capitalisation by writing up the 2s. 6d. shares to 5s. is announced. Group net profits rose from £953,557 to £1,374,262, and the final dividend is 14 per cent., making 20 (18) per cent. on the capital as increased by a one-for-four rights issue at 7s. 6d. per 2s. 6d. share.

CAMMELL LAIRD & COMPANY, LIMITED—Group operating surplus fell sharply from £1,388,464 to £571,557 in 1959 and the net profit of the parent is £575,541, compared with £171,826 in 1958 when £671,375 was retained by subsidiaries. The dividend is reduced to 7 (15) per cent., but with the 4 per cent. final there is a special payment of 2½ per cent. tax free.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED—Lord Chandos, the chairman states, "The demand for our products has shown a notable increase and we are budgeting for increased profits on our ordinary trading accounts." Marginal profits were expected in 1960 in cables where the turnround from profits to losses had made an adverse difference of £1,400,000 to trading results.

RUGBY PORTLAND CEMENT COMPANY, LIMITED—The

current 25 per cent. dividend rate will be maintained after the proposed one-for-seven scrip issue. It is also proposed to increase the nominal amount of the authorised share capital by £500,000 which will be held in reserve. Group gross profit was £1,933,900 (£1,552,275) and net profit increased from £828,671 to £946,510.

KERRY'S (GREAT BRITAIN), LIMITED, manufacturers of machinery and engineers' merchants and stockists, etc., of London, E.15—A final dividend of 10 per cent. makes 13¼ per cent. for 1959, compared with a single payment of 12½ per cent. for 1958. An issue by way of rights of £155,000 is to be made to stockholders in the proportion of six new shares for every 25 5s. units held at 7s. 6d. each.

MIDLAND ALUMINIUM, LIMITED—Applications for 1,125,035 shares were received for the total of 1,153,800 shares offered in the recent rights issue. Applications for an additional 351,206 shares were received for the 28,765 remaining shares and these will be allocated on the following basis:—One to 40 shares, in full; 41 to 500, 40 shares; 501 to 1,000, 55; 1,001 to 5,000, 80; more than 5,000, about 100 shares.

BRITISH ROLLMAKERS CORPORATION, LIMITED—The new year has started with a good order-book and the plant is working to capacity, states the chairman, Mr. Evan Ag. Norton. "Our aim is not only to make good last year's recession in profits, but also to restore the rising trend, a feature of the corporation since its inception." Net profit was £429,836 (£467,016), and the dividend is maintained at 12 per cent.

COCHRAN & COMPANY ANNAN, LIMITED, engineers and boilermakers—The interim at 2 per cent., tax free, on account of the year ending June 30, 1960, is maintained and the directors state that profits for this year will be lower. Though it is not possible to forecast the exact results for the year, it is hoped that the final will be not less than 5 per cent., tax free, making 7 per cent. net for the year against 9 per cent. previously.

PRESSED STEEL COMPANY, LIMITED—The rights issue comprises 7,151,013 ordinary 5s. shares to be offered at 30s. each to ordinary shareholders and holders of 5½ per cent. convertible debenture stock, 1977-82, registered on April 19. Ordinary holders will be offered two new shares for every 25s. ordinary capital now held, and holders of convertible debenture stock will be offered 66 new shares for every £125 of stock held.

METAL CLOSURES, LIMITED, of West Bromwich (Staffs)—The dividend is raised 24 per cent. (21¾ per cent. equivalent) and scrip issue and share consolidation proposals will result in a holder of an existing 4s. share becoming a holder of two shares of 5s. It is proposed to issue £1,000,000 debenture stock to implement the policy of equipping factories with the most up-to-date plant. Group profit, before tax, was £831,685 (£413,388, excluding John Dale, Limited, acquired during 1959).

PRIOR STOKERS, LIMITED, of London, N.7—The chairman, Mr. Alphonse de Chimay, states that the National Coal Board's lack of enterprise for coal sales until recently, has allowed oil firing to make unchallenged progress in Great Britain. A considerable effort is now required to rectify this "regrettable state of affairs." The NCB's present efforts to popularise coal burning should mean that more underfeed stokers will be put into service. Research work has enabled the company to market a new "clean air control" for underfeed stokers, to prevent atmospheric pollution under the worst operating conditions. Net profit was £12,486 (£14,686). A dividend of 12½ per cent. less tax is recommended.

Increases of Capital

WELDING RODS, LIMITED, Sheffield, increased by £81,900, in £1 ordinary shares, beyond the registered capital of £2,100.

GURNARD ENGINEERING, LIMITED, Derby, increased by £19,900, in £1 shares, beyond the registered capital of £100.

MINE & RAIL EQUIPMENT, LIMITED, Nottingham, increased by £900, in £1 ordinary shares, beyond the registered capital of £100.

MOSS GEAR COMPANY, LIMITED, Birmingham, increased by £500,000, in 5s. shares, beyond the registered capital of £1,150,000.

METAL CLOSURES, LIMITED, London, W.1, increased by £665,000, in 4s. ordinary shares, beyond the registered capital of £1,000,000.

FRY'S DIECASTINGS, LIMITED, London, S.W.19, increased by £100,000, in £1 ordinary shares, beyond the registered capital of £500,000.

METAL AGENCIES COMPANY, LIMITED, Bristol, increased by £500,000, in 5s. ordinary shares, beyond the registered capital of £1,000,000.

ARCHIBALD JOHNSTONE (ENGINEERS), LIMITED, Leeds, increased by £92,500, in £1 ordinary shares, beyond the registered capital of £7,500.

LEWDEN METAL PRODUCTS, LIMITED, London, W.1, increased by £50,000, in £1 ordinary shares, beyond the registered capital of £25,000.

MORGAN COMPONENTS, LIMITED, Stanmore (Middx), increased by £150,000, in £1 ordinary shares, beyond the registered capital of £50,000.

ATLANTIC METAL COMPANY, LIMITED, London, W.C.2, increased by £15,000, in £1 ordinary shares, beyond the registered capital of £10,000.

COLD PRECISION FORGINGS (D. & C.), LIMITED, London, E.C.2, increased by £20,000, in £1 shares, beyond the registered capital of £10,000.

HOLINTER, LIMITED, ironmasters, etc., of London, E.C.4, increased by £80,000, in £1 ordinary shares, beyond the registered capital of £20,000.

WELLINGTON ENGINEERING WORKS, LIMITED, Tipton (Staffs), increased by £349,900, in £1 unclassified shares, beyond the registered capital of £100.

MERSEY CASING & BY-PRODUCTS COMPANY, LIMITED, Widnes, increased by £50,000 in £1 ordinary shares, beyond the registered capital of £100,000.

HAYES IRON & STEEL COMPANY, LIMITED, Lye, Stourbridge, increased by £20,000, in £1 ordinary shares, beyond the registered capital of £10,000.

AVAMORE ENGINEERING COMPANY, LIMITED, Denham (Bucks), increased by £4,000, in £1 "B" ordinary shares, beyond the registered capital of £17,000.

COUNTY PRESSINGS ENGINEERING, LIMITED, Blackmore (Essex), increased by £10,000, in £1 ordinary shares, beyond the registered capital of £5,000.

HEAD WRIGHTSON & COMPANY, LIMITED, Thornaby-on-Tees, increased by £1,000,000 in 5s. ordinary shares, beyond the registered capital of £2,500,000.

SKEFKO BALL BEARING COMPANY, LIMITED, Luton (Beds), increased by £2,500,000, in £1 ordinary shares, beyond the registered capital of £5,000,000.

JAMES MILLS & COMPANY (ENGINEERS), LIMITED, Heywood (Lancs), increased by £20,000, in £1 preference shares, beyond the registered capital of £35,000.

E. BOYDELL & COMPANY, LIMITED, engineers, etc., of Manchester, increased by £180,000, in £1 ordinary shares, beyond the registered capital of £400,000.

SPENBOROUGH ENGINEERING COMPANY, LIMITED, Heckmondwike (Yorks), increased by £58,000, in £1 ordinary shares, beyond the registered capital of £42,000.

C. J. TAYLOR & SON, LIMITED, engineers and smiths, etc., of York, increased by £15,000, in £1 ordinary shares, beyond the registered capital of £20,000.

BRITISH TOOL & ENGINEERING COMPANY, LIMITED, of Wolverhampton, increased by £160,000 in £1 ordinary shares, beyond the registered capital of £40,000.

WARREN JAMES, LIMITED, general engineers, etc., of Redditch (Worcs), increased by £10,000, in £1 ordinary shares, beyond the registered capital of £10,000.

SPOONER DRIVER & ENGINEERING COMPANY, LIMITED, Ilkley (Yorks), increased by £45,000 in £1 ordinary shares, beyond the registered capital of £150,000.

SOUTHAMPTON PRECISION ENGINEERING COMPANY, Toton, Southampton, increased by £13,500, in £1 "A" shares, beyond the registered capital of £7,000.

SMITH & NETHERWOOD, LIMITED general engineers, etc., of Huddersfield, increased by £14,000, in £1 ordinary shares, beyond the registered capital of £3,000.

MIDCO STEAM SPECIALITIES, LIMITED, brassfounders, etc., of Nottingham, increased by £37,000, in £1 ordinary shares, beyond the registered capital of £3,000.

CHARLES JONES OF ALDRIDGE, LIMITED, engineers, etc., of Aldridge (Staffs), increased by £10,000, in £1 ordinary shares, beyond the registered capital of £20,000.

KING'S LANGLEY ENGINEERING COMPANY, LIMITED, King's Langley (Herts), increased by £30,000, in £1 "A" ordinary shares, beyond the registered capital of £20,000.

Coalfield News

NCB Drilling Tower Changes Course

SEA-GOING drilling tower owned by the National Coal Board and now lying off the entrance to the River Tyne is to be moved about a mile farther north. The tower was built at a cost of £150,000 and during the past two years has investigated coal resources off the north-east coast.

The first borings were made near Horden and Blackhall collieries, and later two sites off Sunderland were explored. The tower was eventually towed to its present position where it has been exploring reserves which may be worked from Westoe Colliery, South Shields.

PUBLIC open days are to be held at Hem Heath Colliery (Staffs) for a fortnight, beginning on June 13, as part of Stoke-on-Trent's jubilee celebrations.

COMPETITION for St. John Ambulance Brigade adult ambulance and nursing teams held in Nottingham on Saturday was won in both sections by teams from Hucknall Colliery.

TO MINIMISE the possibility of thefts from miners' lockers the Derbyshire branch of the NUM is asking that wages of night and afternoon shift workers should be paid when their shifts end.

MINERS IN SOUTH WALES have been called upon by leaders of the NUM to boycott matches between Glamorgan Cricket Club, the Welsh Rugby Union, and South African touring teams.

RICHARD ATTENBOROUGH is to appear on the stage of a cinema showing his film "The Angry Silence" at Aberdare (Glam) on May 16, to answer criticisms of the film by South Wales miners.

HARVEY SEAM at Harton Colliery (Co. Durham) is to be closed since it is no longer economical. About 95 miners will be affected and as many of them as possible will be found work at other pits in the Area.

IN RECOGNITION of more than 50 years' service with brass bands, the National Brass Band Club has presented a certificate to Mr. W. J. Stokes, euphonium player with Nostell Colliery Band, near Wakefield (Yorks).

COAL AND COKE shipments from the South Wales ports last week at 49,236 tons were the best for a month. This compared with 35,287 tons during the previous week and 53,064 tons in the corresponding week of last year.

"NO OUTSIDE PLAYERS" rule introduced by the Rossington Colliery Welfare Committee may mean the end of the colliery's link with the Yorkshire Council Cricket League. The team is so weakened by the rule that it feels it cannot continue in that class of cricket.

BOTH the senior and junior sections of the annual ambulance contest of the West Fife Area of the Scottish Divisional Coal Board, held at Dunfermline on Saturday, were won by Bowhill Colliery. The results were as follow:—Seniors: 1 Bowhill No. 1; 2 Kinglassie; 3 Bowhill No. 2. Juniors: 1 Bowhill; 2 Glencraig; 3 Comrie.

DERBYSHIRE BRANCH of the National Union of Mineworkers has re-elected Mr. F. Peacock president. Mr. Stanley Mellors was elected vice-president and is succeeded as member for the Heanor Area by Mr. Peter Nicklin. Mr. George Lunn and Mr. George Butler will represent the Ilkeston Area. Mr. E. Johnson also joins the executive council.

Ruhr's Part in West German Coal Output

RUHR coalfields accounted for 81.3 per cent. of Western Germany's coal output last year. In 1958, these coalfields produced 82.1 per cent. of the total output. Production in other coalfields last year was: Saar, 11.6 (11) per cent.; Aix-la-Chapelle, 5.6 (5.4) per cent.; and Lower Saxony, 1.6 (1.5) per cent. The 1959 national output was 4.8 per cent. below the previous year's and there was a rise in daily production of 3 per cent. and in output per manshift of 11.3 per cent.

In the first week of April, German output of hard coal fell to 2,718,500 tons compared with 2,849,700 tons in the week before. This figure, however, was 538,600 tons higher than the corresponding figure last year. Coke production rose to 703,700 (695,600-648,200) tons. Pig-iron production was 385,100 (383,300-257,100) tons, while raw steel dropped to 466,300 (479,300-318,000) tons.

In the first quarter of this year, Austria produced 1,604,308 tons of coal, compared with 1,608,762 tons in the same period last year. Despite the overall drop, output in March at 542,100 tons, was well above the March figure last year (523,894 tons).

NCB May Drop Prices for Horticulturists

PLANS to supply glasshouse users with reduced-price coal are being considered by the National Coal Board, it was learned after a meeting in Edinburgh on Thursday of last week between board representatives and the horticultural committee of the National Farmers' Union of Scotland.

Committee convener, Mr. W. Inverarity, said the board had given an assurance that its new hire-purchase plan would cover the installation of mechanical stokers used in horticulture. He added that grants could be obtained for the modernisation of heating plant and hoped that as many growers as possible would take advantage of the scheme.

Derbyshire Miners "Sentenced" to Loss of Wages

NOTICES issued by the National Coal Board, warning 300 Derbyshire miners that they would be moved to other pits, amounted to the men being "sentenced" to lose up to £12 a week in wages, Mr. Bert Wynn, Derbyshire Area secretary of the NUM, said on Sunday. The affected men are coal-face workers who have become redundant at their own pits. They are to be offered alternative work at other collieries, but not at the coal face.

The issue was reported to a meeting of the miners' Area council at Chesterfield, and it was decided that the council should open negotiations with the National Coal Board immediately.

NATIONAL COAL BOARD trophy for the best mining student of the year at Easington Technical College, Peterlee (Co. Durham), was won by Raymond Lock, Horden Colliery. The award for mining students' alternative courses went to Eric Burrows, Vane Tempest Colliery.

Exports of British Coal

DETAILS of British coal exports and bunker coal shipments in March, and the totals for the first three months of this year and last, are given below.

	Month ended Mar. 31.	Two months ended March 31.	
	1960.	1959.	1960.
Categories.	Tons.	Tons.	Tons.
Anthracite—			
Large	4,485	8,316	18,518
Graded	8,963	54,941	48,280
Cleaned smalls	22,044	37,840	58,019
All other	17,737	111,862	84,102
Steam coal (including household)—			
Unscreened	651	13,704	6,683
Large	60,602	54,517	216,382
Graded	26,935	82,439	137,238
Cleaned smalls	75,726	62,315	266,147
Untreated smalls	77,783	200,220	252,683
Other	12,784	73,062	54,406
Gas coal—			
Unscreened	12,654	32,157	64,201
Large	4,393	1,224	9,481
Graded	34,320	69,381	112,940
All other	2,568	2,989	11,781
Coking coal—			
Cleaned smalls	3,422	14,840	6,465
Other	9,538	35,797	30,544
TOTAL	374,655	855,604	1,377,870
Destinations.			
Canada	1,770	1,991	1,792
Other Commonwealth countries	4,089	7,334	11,616
Eire	93,855	184,848	352,589
Finland	8,050	26,060	27,488
Sweden	24,466	64,257	102,190
Norway	64,761	206,737	226,673
Denmark	86,522	271,842	480,509
Western Germany	39,794	83,255	106,653
Netherlands	96,447	151,430	247,623
Belgium	7,064	80,765	44,646
France	15,687	104,941	69,964
Switzerland	620	2,089	2,261
Portugal	11,363	9,440	46,307
Italy	21,618	9,357	46,693
Argentina	—	16,820	5,599
Other foreign countries	7,599	17,783	30,431
Fuel taken on board vessels engaged in the foreign trade (including fishing vessels) for their own use—			
British flag	36,179	154,682	107,156
Other flags	3,712	12,668	11,718

Exports of Coke and Patent Fuel

THE following table gives figures of exports of coke and manufactured fuel from the United Kingdom during March, and the totals for the first three months of this year and last.

Products.	Month ended March 31.	Three months ended March 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Gas coke	36,547	174,889	177,278
Hard coke	33,267	58,285	111,183
Breeze	33,566	110,538	97,297
Manufactured fuel	5,670	39,633	39,406
TOTAL	109,050	383,345	425,164

Imports and Exports of Mining Machinery

ACCORDING to Board of Trade returns, mining machinery (other than portable power tools) valued at £86,895 was imported during March, compared with £96,497 in March, 1959. Imports in the first three months of this year were valued at £272,343, against £336,383 in the corresponding period of last year.

The appended table contains figures of export values of mining and well-drilling machinery in March, and values for the first three months of this year and last.

Destination.	Month ended March 31.	Three months ended March 31.	
	1960.	1959.	1960.
	£	£	£
Union of South Africa	2,597	6,183	10,343
Rhodesia and Nyasaland	95	2,682	414
India	3,600	18,558	15,458
Australia	1,357	4,991	4,288
Canada	4,124	2,891	7,339
Trinidad	1,293	1,602	2,173
Other Commonwealth countries and Eire	4,947	11,173	17,539
Netherlands	427	2,031	1,121
France	301	885	2,583
Venezuela	122	1,923	442
Other foreign countries	8,880	31,995	37,065
TOTALS			
Well-drilling machinery—			
Petroleum	5,380	26,381	25,948
Other	610	3,565	3,858
Mining machinery (excluding portable power tools)—			
Coal-cutters, power-operated—			
Complete	471	5,642	4,071
Parts	2,941	3,588	6,225
Conveyors, underground—			
Complete and parts	9,487	21,660	33,179
Winders, power operated—			
Complete	—	3,134	2,955
Parts	1,052	1,052	3,220
All other	7,802	19,892	19,289
TOTAL	27,743	84,914	98,745

Scotland Should Produce Own Smokeless Fuels

RECOMMENDATION that smokeless fuels should be produced in Scotland is to be made to the Government. Sir Patrick Dollan, chairman of the Scottish Fuel Efficiency Committee, said last Friday that the Government did not approve a smokeless zone unless sufficient supplies of solid fuels were available. In England the estimated requirements amounted to 6,000,000 tons. "On the same basis Scotland should have about 1,000,000 tons, and we should like to be guaranteed a certain quantity."

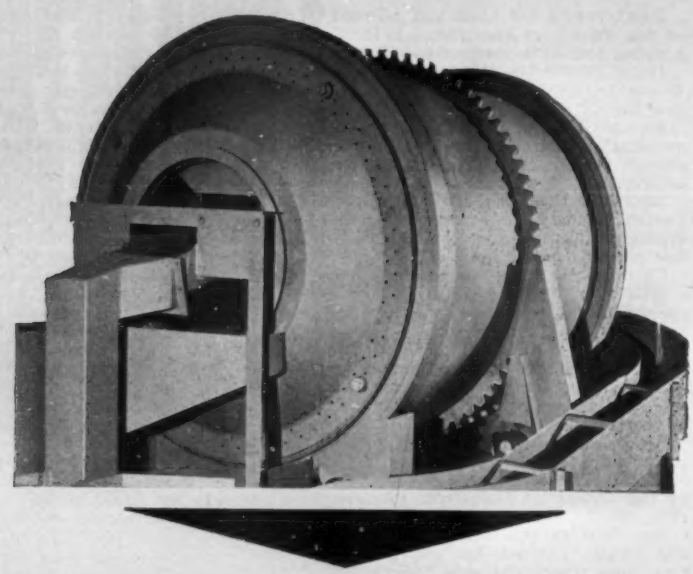
Sir Patrick pointed out that Scotland was lagging behind England and Wales in the creation of smokeless zones. Twenty-six zones had been approved or were under consideration, but he thought the number should be at least 50.

VISLOK ENGINEERING, LIMITED—Mr. J. H. Appleton and Mr. W. C. Townsend (production works manager) have joined the board.

clean coal

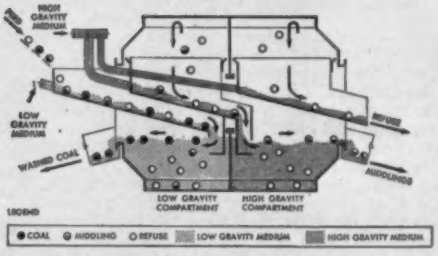
middlings

refuse



from ONE vessel

The WEMCO Two-Compartment Drum Separator is a single, slowly rotating vessel containing two individual heavy medium pools of different, and adjustable, specific gravities. The low gravity medium in one compartment separates a primary float product, the sink material being lifted and sluiced into the second compartment where middlings and true sinks are separated. With their associated equipment, these robust, hard-wearing units can be used to extend existing plants, or as part of new installations.



Other WEMCO equipment:
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CL22

NEWS IN BRIEF

BASIS PRICES for basic and Siemens-Martin grades of fine sheet have been raised in the Saar by DM 10 a metric ton, an increase of from 1.6 to 1.8 per cent.

OVER 250,000 yds. of cables have been supplied by British Insulated Callender's Cables, Limited, for the new British Road Services' £750,000 Tyneside depot.

FIVE-MILE LONG disused railway cutting has been acquired by Dearne Urban Council (Yorks) to provide an area for the disposal of waste from Dearne Valley colliery.

SHEFFIELD steel firm of C. G. Carlisle & Company, Limited, is planning a new rolling mill on a site at Wadsley Bridge. Application has been made for outline planning permission.

CALL ON the Canadian Labour Congress to launch a boycott of South African goods in protest against apartheid has been made by the 80,000-strong United Steelworkers' of America.

NEW FREIGHT TERMINAL and coal depot at Bradford Street, Walsall, involving the laying of additional sidings and alterations in the office accommodation and staff amenities, is being built by British Railways at a cost of nearly £500,000.

REMOVAL OF THE existing import duty on certain petroleum coke is contained in the Import Duties (General) (No. 4) Order, 1960, which has been made by the Treasury. The Order (Statutory Instruments, 1960, No. 737) came into operation on Tuesday.

THE 1960 TRAVEL SCHOLARSHIP offered by Stewarts and Lloyds, Limited, has been won by Mr. G. D. Day, sales representative of the Cardiff office, who is to work in a European refugee camp and otherwise play a part in World Refugee Year.

AFTER 58 YEARS at Michael Colliery (Fife), Mr. Alex Logie has retired. He has never had a day's illness or a day off work, even for holidays, during his long career. For years, Mr. Logie, who is 72, was the "pump king" at the colliery.

DELEGATION of 16 representatives of Spanish banking, industry, and commerce were welcomed by the president of the Federation of British Industries, Mr. W. H. McFadzean, when they arrived in the UK on Monday for a five-day visit at the invitation of the FBI.

SITE of Dixon's Ironworks, Limited, at Govanhill, Glasgow, is likely to be bought for the erection of a carpet factory. The site has been occupied by Dixon's for nearly 120 years, but the works were closed in 1958 in view of the more efficient production at other works of the Colvilles, Limited, group.

ACCOUNTS OF THE publicly-owned subsidiary companies of the Iron and Steel Holding and Realisation Agency have been published. These include Richard Thomas & Baldwins, Limited. Copies can be obtained on application to the agency at 1, Chester Street, London, S.W.1, at 10s. each, postage paid.

FIRE DESTROYED the floor containing the Department of Metallurgy in the wing now mainly incorporated in the Cavendish Laboratory at Cambridge on Sunday afternoon. The wing is part of the old engineering laboratory which was added in 1900 in memory of John Hopkinson, the engineer, and his son.

TO COVER Kenya, Uganda, and Tanganyika, Leyland Motors, Limited, has formed a new company, Leyland Albion (East Africa), Limited, with its head office and works in Nairobi. The board comprises Sir Henry Spurrier and Mr. J. L. Blackwood Murray, the company's resident director in southern Africa. Sales and service in Somalia will be handled by the new company and a concessionaire is shortly to be appointed in Mogadiscio.

FOUNDRIES in and around Glasgow had the facilities to produce the high-duty irons which would be needed when a motor vehicle manufacturing industry was set up in Scotland, Bailie Alexander Hart said on Saturday at dinner in Glasgow to mark the jubilee of the Scottish branch of the Institute of British Foundrymen.

ARRIVALS OF iron and manganese ore into the United Kingdom during the first quarter of 1960 totalled 3,955,000 tons, compared with 2,785,000 tons in the equivalent period last year, states B.I.S.C. (Ore), Limited. Monthly arrivals (in tons) were: January, 1,441,000 (1,027,000); February, 1,184,000 (889,000); and March, 1,330,000 (869,000).

GEO-THERMAL STEAM investigation programme, costing £1,000,000 and spread over five years, will be started in the coming financial year, states Mr. Hugh Watt, New Zealand Minister of Works. The Government has authorised £200,000 for work in 1960-61, mainly at Wairakei, in central North Island, and on the fringes of the Rotorua thermal area.

AT THE OPENING of the Fuel Efficiency & Power for Industry Exhibition at Olympia on Wednesday, Sir Dennis Proctor, Permanent Secretary to the Ministry of Power, presented each of 10 boiler operators with a cheque and certificate awarded by the National Industrial Fuel Efficiency Service, in recognition of their success in the City & Guilds Examination.

REPRESENTATIVES OF THE American Kaiser Steel Corporation and the Westinghouse group are touring Formosa to study steel production there. The Kaiser Corporation wants to build a steelworks in the Far East with a capacity of about 160,000 short tons and costing $45,000,000. The Japanese Fuji Iron & Steel Company, Limited, is also interested in building a steel plant in Formosa.

"SUBDUED IMPROVEMENT" in the flow of new orders to British shipyards, which began last December, has continued into the first quarter of this year, according to the Shipbuilding Conference. In the first quarter, UK yards received orders for 53 ships of 196,000 gross tons, compared with 69 vessels of 172,000 tons in the last quarter of last year and with only 55,000 tons in the first three months of last year.

FOLLOWING HIS ELECTION as chairman for the third successive year of the South Wales Coal Exporters' Association, Mr. Philip E. Holden said that he was optimistic of the future for the trade. The efforts of exporters through the British Coal Exporters' Federation had done much to strengthen the realisation that Britain's coal exports are an invaluable contribution to the economy of the country and of Europe generally.

SEVEN NEW MEMBERS were introduced to the "25-year Club" of Fescol, Limited, electro-chemical depositors and engineers, of London, N.7, at a special luncheon recently. The club was formed by the directors some years ago for employees with 25 years' service. Since its foundation, 40 years ago, the firm has had no labour disputes. More than half its employees have worked there for at least ten years.

AGREED ORDERS were made by the Restrictive Practices Court on Tuesday that certain restrictions contained in the Zinc Oxide Federation's agreement, the Association of Paving and Kerb Manufacturers' agreement, the Electric Light Fittings Association's agree-

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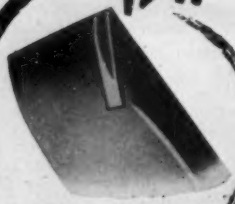

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ment, and the Metal Bedsteads Association's agreement were contrary to the public interest. The associations have terminated their agreements, which related mainly to price fixing.

UNEMPLOYMENT FIGURES in the four weeks from March 14 to April 11 fell by 22,000 to 391,000, the lowest figure since December, 1957. This is 1.8 per cent. of the estimated total number of employees, compared with 1.9 per cent. in March and 2.4 per cent. in April, 1959. Scottish unemployment dropped by 6,000 but its rate at 4 per cent. is still the highest for the UK. The northern region fall was 3,600 to give a rate of 3 per cent.

SPECIAL CONFERENCE is to be held early next year to examine the social consequences stemming from the world-wide drop in the demand for coal. Invitations are being sent by the International Labour Organisation to Britain, the United States, Belgium, France, Western Germany, the Netherlands, and Japan. Britain will send a three-man delegation representing the Government, the National Coal Board, and the National Union of Mineworkers.

Prospects for Better Trade with UAR

HOPES for a steady improvement in trade between the United Kingdom and the United Arab Republic were expressed last week by Mr. George Nelson, managing director of the English Electric Company, Limited, who led the recent British mission of businessmen and industrialists to the UAR. The purpose of the mission was to restore trading contacts and increase two-way trade.

At a Press conference at the Board of Trade, Mr. Nelson said that the mission found that the new emphasis in the UAR on industrialisation, coupled with limited foreign exchange resources, had altered the pattern of imports. Priority was now given to capital equipment for the economic development programme and to raw materials for industry.

Mr. Nelson said that for her second five-year plan, the UAR needed supplies of agricultural machinery particularly for irrigation, power and communication equipment, and comprehensive plant for industrial development.

He stressed that there was no discrimination against British companies. "British goods are more liked both for their quality and for the British methods of trading," he added.

Recent Wills

GUEST, CHARLES, formerly clerk of works with the National Coal Board at Stanton £3,815

CRAMMOND, E. R., deputy chairman of Hopkins, Limited, valve manufacturers, of Huddersfield ... £79,767

WHITEHOUSE, G. T. C., chairman and joint managing director of Metal Products Company (Willenhall), Limited £104,167

BIDGOOD, H. W. G., former joint managing director of the paints division of Imperial Chemical Industries, Limited £26,303

PEEL, FREDERICK, late landsale depot manager for No. 2 (Doncaster) Area of the North-Eastern Divisional Coal Board £3,587

KENT, COL. SIR JOHN, former chairman of Taylor Tunnicliff & Company, Limited, Taylor Tunnicliff (Electrical Industries), Limited, and other companies £493,695

Board Changes

HOPKINSONS, LIMITED—Mr. A. A. Smith has joined the board.

SAMUEL HEATH & SONS, LIMITED—Mr. Ian A. Heath has joined the board.

COCHRAN & COMPANY, ANNAN, LIMITED—Mr. A. D. C. Gunn has been appointed technical director.

WARSOP POWER TOOLS, LIMITED—Mr. N. W. Warsop has retired from the board for health reasons.

FOUNDRY SERVICES (HOLDINGS), LIMITED—Mr. J. A. Metcalfe, a director of Minerals Separation, Limited, has been elected to the board.

W. H. PAUL, LIMITED—Mr. G. K. Thomson, Mr. E. Dean, Mr. G. B. Scarlett, and Mr. J. Crowshaw have been elected to the board.

ALBRIGHT & WILSON, LIMITED—Mr. Brian Topley, who has been elected deputy chairman, joined the company in 1936 and has been a director since 1944.

PICKFORD, HOLLAND & COMPANY, LIMITED—Mr. S. B. Turner has left the board. Mr. F. J. Houghton and Mr. G. D. A. Bertram have been appointed directors.

STEEL BROS. & COMPANY, LIMITED—Mr. P. G. G. Salkeld has been appointed chairman in succession to Mr. J. K. Michie, who has retired. Mr. K. Lockley and Mr. W. F. G. Salkeld have been appointed directors.

TIMKEN ROLLER BEARING COMPANY, LIMITED—Mr. W. R. Timken has been elected president in succession to Mr. Dwight A. Bessmer who has resigned because of ill-health. Mr. G. L. Deal, secretary-treasurer, Mr. P. J. Reeves, vice-president in charge of sales, and Mr. Henry Tobey, vice-president in charge of the manufacturing and rock bit division, have joined the board.

SALEM ENGINEERING COMPANY, LIMITED—Mr. H. Jones, a director has been appointed managing director of the company and its subsidiaries, Salem Development Company, Limited, Alloy Fabrication, Limited, and B-J Construction, Limited. Mr. F. Coulton, a director, has joined the board of Alloy Fabrication and Mr. J. H. Scorer, a director of Alloy Fabrication, has been appointed to the board of the Salem Engineering Company.

THOMAS ROBINSON & SON, LIMITED—Mr. Henry Clayton, who has been elected to the board, is chairman of the Saw Trade Association's technical committee, and a member of the technical committee of the Machine Tool Trades Association's woodworking machinery manufacturers' section. He is also a founder fellow of the Institute of Machine Woodworking Technology. He joined the company as an apprentice in 1932.

Biggest-ever Transductor for Dutch Research

WHAT is believed to be the world's largest electromagnetic control system or transductor has just been built by Gresham Transformers, Limited, of Hanworth (Middx), and will be used for research work in Holland. The value of the order is £17,500.

This equipment, which weighs more than 20 tons, will be used in conjunction with germanium rectifiers manufactured by Westinghouse Brake & Signal Company, Limited, of London, N.1, to control an output current of 12,000 amperes.

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Imports and Exports of Iron and Steel

FIGURES of imports and exports of iron and steel in March are given in the following tables, based on Board of Trade returns, and including first quarter totals for 1959 and 1960.

Total Exports of Iron and Steel

Destination.	Month ended March 31.	Three months ended March 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Cyprus	166	343	420
Sierra Leone	462	1,389	1,245
Ghana	2,790	7,891	5,915
Nigeria	6,535	18,870	17,418
Union of South Africa	5,914	14,673	18,017
Rhodesia and Nyasaland	2,374	5,309	5,620
Tanganyika	882	6,611	2,384
Kenya	1,360	7,120	4,947
Uganda	106	2,088	421
Mauritius	719	400	1,183
Aden	215	696	462
Bahrein, Qatar, and Trucial States	3,400	3,126	4,951
Kuwait	722	4,428	1,394
India	30,630	39,769	70,861
Pakistan	5,409	8,938	19,621
Singapore	1,840	6,723	4,331
Malaya	1,418	2,954	4,624
Ceylon	5,368	12,286	14,992
British North Borneo	347	543	1,282
Hongkong	6,115	15,893	18,001
Australia	11,168	24,190	41,704
New Zealand	9,121	24,014	24,557
Canada	16,250	24,488	55,367
Jamaica	3,302	5,355	7,378
Trinidad	5,034	8,182	11,899
British Guiana	694	1,342	1,916
Other Commonwealth countries	3,433	10,213	9,650
Eire	5,437	10,410	15,696
Soviet Union	3,746	528	7,206
Finland	2,579	5,401	9,028
Sweden	16,595	29,247	56,927
Norway	12,229	22,618	35,654
Denmark	8,978	21,994	26,961
Western Germany	14,034	27,924	49,051
Netherlands	13,535	17,199	37,938
Belgium	2,330	7,426	10,241
France	1,038	583	2,245
Switzerland	751	2,082	3,096
Portugal	1,292	3,991	3,914
Spain	6,272	5,369	9,101
Italy	4,419	11,580	12,202
Austria	738	653	1,350
Yugoslavia	3,659	825	5,565
Greece	960	3,195	4,087
Turkey	619	1,489	976
Netherlands Antilles	264	745	1,558
Portuguese East Africa	193	434	1,076
Egypt	2,501	1,090	6,180
Sudan	852	2,801	3,028
Lebanon	80	92	354
Israel	1,439	1,926	6,653
Saudi Arabia	50	2,207	148
Iraq	2,177	30,810	7,695
Iran	10,700	9,039	26,008
Burma	601	1,542	2,532
Thailand	425	2,709	2,359
Indonesia	3,307	880	7,970
China	3,582	18,909	17,386
Japan	16,391	18,717	27,431
Philippine Republic	472	838	2,604
USA	24,883	21,870	87,359
Cuba	984	1,239	2,542
Colombia	310	295	2,710
Venezuela	3,637	25,277	11,881
Ecuador	106	290	600
Peru	815	744	1,902
Chile	205	532	651
Brazil	2,075	4,519	5,499
Uruguay	1,026	480	2,937
Argentina	7,920	45,340	26,702
Other foreign countries	13,520	11,671	36,431
TOTAL	323,500	635,344	933,994

Total Imports of Iron and Steel

From	Month ended Mar. 31.	Three months ended March 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Union of South Africa	3,384	6,346	12,968
Rhodesia and Nyasaland	420	1,033	1,920
Canada	1,339	2,438	7,232
Other Commonwealth countries and Eire	3,211	2,776	9,726
Soviet Union	5,264	1,892	12,871
Sweden	4,574	6,439	11,802
Norway	11,307	18,441	33,427
Poland	3,534	605	6,620
Western Germany	17,359	7,340	43,802
Netherlands	14,380	37,355	44,494
Belgium	10,301	5,713	21,237
Luxembourg	1,277	1,588	2,938
France	5,525	5,464	15,099
Italy	1,682	214	4,027
Austria	1,280	921	3,318
Japan	792	529	1,967
USA	16,214	3,370	28,020
Other foreign countries	3,843	2,031	7,937
TOTAL	105,686	104,495	269,405
Iron and steel scrap and waste, fit only for the recovery of metal	18,602	520	42,154

Exports of Iron and Steel by Product

Product.	Month ended March 31.	Three months ended March 31.	
	1960.	1959.	1960.
	Tons.	Tons.	Tons.
Pig-iron	14,279	31,380	58,695
Ferro-columbium (niobium)	19	16	40
Ferro-tungsten	115	390	323
Other ferro-alloys	906	827	2,443
Ingots, blooms, billets, slabs, sheet bars (incl. tinplate bars), and similar primary forms	4,493	18,874	17,795
Pieces roughly shaped by forging	363	310	476
Iron bars, rods, angles, shapes, and sections	88	253	434
Steel bars, rods, angles, sections, and shapes	55,236	69,348	166,733
Iron plates and sheets	157	105	304
Universal plates	1,806	2,448	5,540
Steel plate, 3mm. and under 4.5mm. thickness	3,168	12,142	8,981
Ditto, 4.5mm. or more in thickness	42,386	34,247	92,749
Blacksheets and blackplate	29,353	61,438	82,900
Hoop and strip	9,181	16,771	25,520
Tinplate	40,388	115,617	147,585
Decorated tinplate	543	2,752	1,056
Galvanized sheets	7,118	22,442	18,249
Other (incl. tinned sheets, terneplate, and ternesheets)	3,001	3,483	8,857
Railway and tramway construction material	17,878	43,578	37,360
Wire rods of steel (incl. alloy steel)	4,959	8,272	16,606
Wire	12,958	22,804	32,634
Tubes, pipes, and fittings	75,105	167,847	208,714
TOTAL	323,500	635,344	933,994

DERBYSHIRE BRANCH of the NUM has raised £600 for the relatives of the 400 miners killed in the Orange Free State mine disaster.

CRAVEN BROS. (MANCHESTER), LIMITED, makers of iron castings, machine tools, etc., of Stockport (Ches)—Net profit for 1959 was £148,543 (£126,111), after tax of £110,000 (£107,000). One-for-one scrip issue is proposed by capitalising £700,000 of reserves. A final dividend of 10 per cent. makes 15 (10) per cent. for the year.